

NATIONAL PARK SERVICE

BUFFALO NATIONAL RIVER

WATER QUALITY REPORT
1988

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WATER QUALITY REPORT, 1988

EXECUTIVE SUMMARY

The water quality monitoring program at Buffalo National River establishes baseline data against which future changes can be compared, and determines compliance with state water quality standards. Sampling sites in 1988 include 9 sites along the river corridor, 21 tributaries and 3 springs. The sampling schedule entails sampling of the river corridor once each month and the tributaries and springs twice each month during the summer. The parameters analyzed at Buffalo River are fecal coliform bacteria, turbidity, pH, temperature, specific conductance, dissolved oxygen and stream flow. In addition, the river corridor is sampled once each season for nutrient parameters and twice each year for selected metals via contract analyses.

Fecal coliform bacteria are of interest to the Buffalo National River because they are the primary indicators of fecal waste contamination from warm-blooded animals. Associated with this waste are a myriad of pathogenic bacteria and viruses which can be contracted by man from the waters receiving fecal material. Each year, since the initiation of the water quality monitoring program in 1985, fecal coliform levels have risen in the Buffalo River. This trend indicates increased fecal contamination from a wide range of waste producing activities in the Buffalo River's watershed. The site of the heaviest contamination within the river corridor is at the downstream end of Boxley Valley (at the Ponca low-water bridge above the confluence with Ponca Creek). Several researchers have indicated that cattle grazing in Boxley Valley, with livestock having direct access to the Buffalo River, are responsible for the elevated bacteria levels. Fecal coliform levels at Boxley Valley, and the entire river corridor, attain highest concentrations in association with rainstorm-runoff events. While the bacteria counts have increased steadily, the river overall is still well within state standards for the parameters measured with the exception of rain-events and the Ponca site.

Two major tributaries to the Buffalo River (Richland Creek and Tomahawk Creek) had exceptionally high fecal coliform concentrations during the summer of 1988. Richland Creek exceeded state standards for fecal coliform concentrations for approximately two months. Richland Creek also became very turbid as a result of algal growth believed to have been stimulated by nutrients supplied from cattle excrement. Richland Creek serves as an example of what can happen to any Ozark Highlands stream overloaded with organic wastes. Cattle grazing in the area were repeatedly observed depositing manure directly into the stream. This input, combined with below average summer stream flows, led to the eutrophic condition. Tomahawk Creek demonstrated fecal coliform levels similar to Richland Creek, but the nature of the source has not been fully investigated. Nutrient parameters are being measured



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at the tributary sites in 1989 and will be used to help highlight problem areas.

Springs within the Buffalo River's watershed showed fecal contamination directly proportional to the degree of open channel conduit flow developed within the spring system and the type of land-use in the spring's recharge zone. A significant portion of the Buffalo River's watershed is underlain by limestone and dolomite formations developed into a karst terrain which is highly susceptible to groundwater contamination. Once contaminated the groundwater can move rapidly with little or no attenuation of the pollutants to emerge as surface waters from springs and fracture systems. As the watershed becomes increasingly developed, ground water transport of non-point source pollutants to the Buffalo River are expected to increase.

The following recommendations are based on the results of 4 years of water quality monitoring:

- 1.) BNR should take the steps necessary to comply with all EPA and Standard Methods guidelines and recommendations regarding water quality analyses.
- 2.) A year round water quality program should be initiated.
- 3.) In-house ability to perform nutrient analyses should be incorporated into an on-site lab.
- 4.) Intensified studies of identified problem areas should be initiated in addition to what is presently required by the water quality monitoring plan.
- 5.) Development of a hazardous materials spill plan.

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INTRODUCTION

Buffalo National River (BNR) was established by Congress (P.L. 92-237) in 1972 "for the purposes of conserving and interpreting an area containing unique scenic and scientific features, and preserving as a free-flowing stream an important segment of the Buffalo River...". The Buffalo River is also designated by the Arkansas Department of Pollution Control and Ecology (ADPCE) as Outstanding Natural Resource Waters (ONRW) with extraordinary recreation and aesthetic values, the highest ranking of stream quality in this system (ADPCE, 1988). Specific standards designated by ADPCE which apply to BNR under the ONRW designation are employed when examining water quality data. In addition, the Buffalo River and most of the tributaries sampled by BNR are designated as primary contact recreation waters with further specific standards applicable between April 1 and September 30.

The WQM program at BNR is designed to evaluate the waters of the Buffalo River and its major tributaries to determine compliance with state standards. The water quality monitoring program also defines the present water quality of the surface and ground waters at BNR, thereby establishing a baseline against which future changes can be compared. Park managers are interested in this information as it relates to future demands placed on the Buffalo River and the waters within its drainage basin. As the Buffalo River's watershed becomes increasingly developed, background water quality data will be crucial in understanding the effects of this development on the water resources. The ultimate goal of the WQM program is the protection of the visitors to BNR and the preservation of all of the Buffalo River's outstanding water resources.

Previous reports (Chaney, 1985; Weeks, 1986 and Mott, 1987) have indicated that agricultural practices within the Buffalo River drainage basin cause observable degradation in the water quality of the Buffalo River and some of its tributaries. The degradation includes high bacteria counts, elevated nutrient levels and increased turbidity caused by excessive plant growth and in-stream disturbances. Springs, discharging from limestone and dolomite formations within BNR, have also been observed to contain high levels of bacteria indicating contamination from agricultural sources or septic fields in the spring's recharge area. Previous water quality studies at BNR indicate surface water and ground water pollution from nonpoint sources increase during run-off associated rain events.

Sampling sites monitored in 1988 include 9 sites along the river corridor, 21 tributaries and 3 springs (Figure 1). The sampling schedule entails sampling of the river corridor once each month and the tributaries and springs twice each month during the summer.

The WQM plan (Buffalo National River, 1985) also requires the river corridor to be sampled for selected metals twice each year and nutrient parameters once each season. As a result of the personnel changes in early 1988 and the intermittent status of the Hydrologic Technician, not all scheduled goals were met in 1988 and the effectiveness of the WQM was reduced.

RESULTS

The data collected during 1988 have been statistically analyzed and expressed graphically in Figures A1-G4 and in tabular form in Tables 1 through 26. The following discussion examines each water quality parameter in detail and makes reference to the appropriate graphs and applicable state standards.

Fecal Coliform

River Corridor: The fecal coliform geometric mean for the river corridor increased for the third consecutive year to 6 col/100 ml in 1988 (Figure C1). For the first year since the WQM program began in 1985, 75% of the samples showed some fecal contamination with the maximum recorded as 567 col/100 ml (Table 20). The maximum values were recorded at Boxley Valley in association with a July rainstorm event of approximately 2 inches (Figures A1 and H). The R1 sampling site was located at the Boxley Bridge where Hwy. 21 crosses the Buffalo River. R2 is located at the Ponca low-water bridge at the downstream terminus of Boxley Valley. Cattle grazing in Boxley Valley upstream from R1 and R2 are the dominant source of the fecal contamination (Malcolm, 1986, Weeks, 1986). In future site R1 will be located near the wilderness boundary at the upstream end of Boxley Valley (Figure 1) allowing parameter values at R2, and the other river corridor stations, to be compared to the background conditions of the waters leaving the Upper Buffalo Wilderness.

The highest geometric mean fecal coliform value for an independent station was associated with R2 in 1988 as in the previous three years (Figure A1). Figure D2 indicates the geometric mean fecal coliform value at station R2 was higher in 1988 than any previous year. Table 1 lists a geometric mean of 44 for R2 while all other stations downstream have a geometric mean of less than 10.

The July fecal coliform values along the river corridor were generally higher than at any other sampling time (Figure B1). Higher maximum fecal coliform values were also observed in the fall as opposed to the late winter or early spring months at station R2. Precipitation and stream flow were below normal during the spring and summer of 1988 (Figure 3) allowing fecal material to accumulate on the agricultural fields within Boxley Valley. Samples collected in association with rain events in July (Figure

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2), and smaller ones in the upper watershed in the fall, all demonstrated anomalous fecal coliform counts at station R2 as a result of the fecal material being flushed into the river at Boxley Valley.

Tributaries: The two tributaries with the highest fecal coliform levels during 1988 were Richland Creek (T9) and Tomahawk Creek (T14, Figure E1). Over the four summer months the tributaries were sampled (Figure F1). Richland Creek had a geometric mean fecal coliform count of 154 col/100 ml (Table 11) attaining maximum values of 610 col/100 ml on August 18 and 594 col/100 ml on September 3. Neither sample was associated with a rain event; rather, they are the result of the exceptionally dry conditions experienced throughout the watershed last spring and summer (Figure 2). In late July Richland Creek became intermittent with no water leaving the pool where samples are collected via the surface, some surface water continued to flow into the pool. Cattle have direct access to this portion of Richland Creek and use the pool to cool down and drink. Nutrients derived from the cattle excrement deposited directly into the pool stimulated algae and phytoplankton growth which caused the turbidity to rise from 1.05 FTU on July 27 to 4.9 FTU on August 18 (Appendix II) as well as the increase in fecal coliform bacteria mentioned above. The conditions of high fecal coliform values and eutrophication in this pool remained for approximately two months before a September rain event washed the nutrient and fecal material into the Buffalo River.

State standards defining acceptable fecal coliform levels applicable to Richland Creek are to be based on a minimum of not less than 5 samples taken over not more than a 30 day period. The specific designation for extraordinary resource waters states that the geometric mean fecal coliform level shall not exceed 200 col/100 ml. Furthermore, for primary contact waters, not more than 10% of the total samples collected during a 30 day period shall exceed 400 col/100 ml (ADPCE, 1988). Although Richland Creek was sampled only twice each month during July and August the aforementioned standards were exceeded. Because the maximum values collected in July and August were above 400 col/100 ml, if 5 more samples had been collected in a 30 day period, 20% of the samples would have exceeded the 400 col/100ml limit imposed by ADPCE. In addition, because this was a persistent problem, the geometric mean of any 5 samples collected over a 30 day period would have exceeded 200 col/100ml.

Tomahawk Creek (T14) demonstrated a maximum fecal coliform count of 776 col/100 ml in association with a .5 inch rain event on September 4 (Appendix II). Other samples collected under normal flow conditions also show higher fecal coliform counts than expected (Figure E1) probably the result of cattle having direct access to the stream above the sampling site. The BNR boundary

encompasses less than 1% of this tributaries watershed (Appendix III) and pollutants accumulated outside the BNR boundary have only a short distance in which to be broken down by the natural aquatic system before mixing with the waters of the Buffalo River.

Seven tributaries (T1, T2, T4, T9, T10, T14 and T15) contained maximum fecal coliform concentrations above 200 col/100 ml (Table 11). All maximum concentrations were associated with rain events and higher staff gage readings (except Richland Creek as discussed above).

Springs: Figure G1 shows the statistical results from the sampling performed on three of BNR's springs. Luallen Spring (S2) and Gilbert Spring (S41) demonstrate the effects of discrete recharge via sinkholes and solution channels within the limestone formations up-gradient from these two springs (Figure G1). Fecal coliform counts attained maximum concentrations in association with rain events. Agricultural wastes and septic field accumulations are flushed into the ground water system through the interconnecting channels dissolved within the limestone. The maximum fecal coliform concentration was recorded as 780 col/100 ml at Luallen Spring. Water from Luallen Spring is commonly used by locals for drinking and bathing purposes and represents a health problem when consumed without treatment. Mitch Hill Spring (S33) has not shown elevated bacteria levels in association with rain events and contains lower fecal coliform concentrations than S2 or S41 under the hydrologic conditions sampled in 1988.

TURBIDITY

River Corridor: 1988 represents the first year turbidity data has been gathered in a consistent manner at BNR. Mean values for the turbidity data were not calculated with the statistics program presently available and for this reason the median is employed as a measure of central tendency for this parameter. The highest median turbidity value is associated with station R1 (Figure A2) and is the result of the small data set (n=3) and the relatively higher gradient and associated velocity at this station. The median turbidity value at Gilbert (R6) and at Hwy 14 (R7) are also relatively high turbidity values. Several land development projects including the new bridge across the Buffalo River at Highway 65 and the campground construction at Tyler Bend, could account for the increased sediment load observed further downstream at R6. The increased turbidity at R7 is difficult to explain but is invariably the result of some land use practice upriver and requires continued monitoring in the future.

Figure B2 indicates that higher turbidity readings occur in the summer months as opposed to the fall. Increased water temperature in the summer facilitates the growth of algae and phytoplankton which are better able to metabolize nutrients under warmer conditions. Any increased nutrient loading above natural

background conditions will adversely affect the aesthetics of the Buffalo River by increasing the turbidity in this manner.

Tributaries: The highest median and maximum turbidity values for the 20 tributaries sampled in 1988 were associated with Richland Creek (T9, Figure E2 and Table 12). The reason for the anomalously high turbidity has been discussed previously under the fecal coliform section. Other tributary sites with median turbidity values greater than 1.0 FTU are Ponca Creek (T2), Cecil Creek (T3), and Calf Creek (T10, Table 12). Nutrient data is being collected at these tributary sites in 1989 and will be useful in determining if higher turbidity values are associated with higher nutrient levels.

Springs: Luallen Spring (S2) demonstrated high turbidity values during rain events (Figure G2). Luallen Spring behaves in a manner similar to that of surface streams during rain events and has a substantial component of discrete recharge. Discharge from Luallen Spring increases within the first few hours of a rain event and returns to near base flow soon after runoff ceases. Luallen Spring is also recharged by diffuse recharge and has not been observed to dry up under drought conditions. The other two springs sampled did not become significantly more turbid in association with rainstorm events.

DISSOLVED OXYGEN

River Corridor: Geometric mean dissolved oxygen (DO) values are relatively consistent throughout the length of the river corridor (Figure A3). Minimum dissolved oxygen values occurred at R2, R4, R5 and R6. R3 maintains a higher DO because it is cooler than the other river corridor stations as a result of the springs feeding into the pools above Pruitt (Figure A4). DO levels remained above state standards of 6 ppm for BNR (ADPCE, 1988) even under the unusually hot and dry conditions experienced in the Buffalo River Watershed in 1988 (Figures 2 and 3). Figure C4 indicates that DO values for 1988 were higher than for any previous year. This is the result of increased DO records collected during the winter months and points to the need for maintaining the sampling schedule outlined in the 1985 WQM plan. An inoperable DO meter during a portion of the year resulted in a reduced data set during 1988.

Tributaries and Springs: Insufficient DO data were collected during 1988 to perform statistical analysis on the tributaries or springs. Ponca Creek (T2) was the only tributary which registered a DO value less than 6.0 mg/l. On August 9, when Ponca Creek was very low and warm, the DO reading was 5.9 mg/l (Appendix II). Because Ponca Creek's drainage area is less than 10 square miles (Appendix III), and the sample was collected during the critical season, the dissolved oxygen standard applicable under these conditions is 2 ppm (ADPCE, 1988). Richland Creek (T9) remained

above the saturation point with respect to DO during the eutrophication period previously discussed (Appendix II).

TEMPERATURE

River Corridor: The widest range of temperatures for a station along the river corridor occurred at R3 (Figure A4). R3 also shows the lowest geometric mean of the 8 stations sampled on a consistent basis in 1988 (R1 was not sampled during the summer months). The reasons for the lower temperatures at R3 are a combination of the springs at Pruitt and the deep east-west trending canyon through which the river flows between Ponca and Pruitt. During the winter months, the sun is low in the southern sky and this portion of the river is predominantly shaded by the adjacent mountains and bluffs. This results in the near freezing temperatures recorded in the winter months at R3.

Figure B4 represents a normal distribution of temperatures with maximum values occurring in the summer and minimum values in the winter. The general shape of the curve defined in Figure B4 is inversely proportional to the curve defined by the DO values in Figure B3. This inverse trend will become better defined when the monthly data becomes consistent in 1989.

Tributaries: The 20 tributaries sampled during the summer of 1988 are of comparable temperature with the exception of Cecil Creek (T3), Davis Creek (T7), Mill Creek (T11) and Rush Creek (T16) being relatively cooler and Big Creek (T18) being relatively warmer (Figure E4). Cooler temperatures are the result of the influence of springs and ground water influx into the tributaries above the sampling location. Warmer tributaries lack the influx of ground water within the zone of influence upstream from the sampling site. In the case of Big Creek (T18), the sampling site is exposed to full sunlight much of the day.

Springs: The range of temperatures at the springs monitored in 1988 are within a few degrees and reflect the mean annual temperature of this area (Figure G4).

SPECIFIC CONDUCTANCE

River Corridor: Figure A5 shows the same general trend in specific conductance as observed in all previous WQM reports; an increase in specific conductance in the downstream direction. Anomalous specific conductance values were not present in the data set. Figure C2 demonstrates only background noise with regard to specific conductance values since 1985. Seasonal variations in specific conductance are observed in Figure B5. During higher precipitation months runoff and vadose recharge mix with the river water and dilute the more conductive ground waters resulting in lower specific conductance values. During the drier summer months, when the river is being recharged by the more conductive ground

water, the specific conductance values are higher by as much as 150 micromhos (Table 10).

Tributaries: Figure E3 shows the specific conductance statistics at 20 tributary sampling sites monitored in 1988. As with the river corridor the conductance values are higher in the lower portions of the watershed. In relation to the upper watershed, the lower watershed is characterized by a higher percentage of limestone and dolomite exposed at the surface. Surface water running over the exposed limestone, and ground water moving within the conduit systems, dissolve the limestone and incorporate conductive ions into the solution. The longer the solution is in contact with the limestone the greater the dissolution and the higher the specific conductance of that solution. Big Creek, also in the lower watershed, is an exception with respect to the other lower watershed tributaries. Big Creek has a lower specific conductance because it drains predominantly Ordovician aged sandstones, shales and lesser amounts of limestone (Aley, 1982).

Springs: Luallen Spring (S2) discharges from the Boone Formation (limestone) and is located within Boxley Valley. Figure G3 shows that the specific conductance of the waters discharging from Luallen Spring are relatively low. Low conductance values indicate shorter residence time for the waters moving within the limestone aquifer and recharging the spring. Low residence time also infers a higher percentage of water entering the ground water system through discrete recharge zones.

Mitch Hill Spring (S33) is located in the middle river area near the confluence of Davis Creek and the Buffalo River. Mitch Hill Spring emerges near the contact between the Boone Formation and undifferentiated Everton and St. Peter rocks (sandstone, shale, and dolomite). High specific conductance values indicate relatively long residence time within the Boone Formation and a significant percentage of diffuse recharge.

Gilbert Spring (S41) emerges near the contact between the Mississippian aged Boone Formation and the undifferentiated middle and upper Ordovician rocks (interbedded limestones and shales). High specific conductance values also indicate a relatively long residence time for the waters discharging from Gilbert Spring.

NUTRIENTS

The nutrient parameters monitored in 1988 occurred in low concentrations within the river corridor (Appendix I). Nutrients are collected once each season and are discussed below.

Winter (02/03/88): Nitrogen (NO₂/NO₃-N) values increased within the river corridor in the downstream direction (Figure N1) during the winter months. River plants which utilize nitrogen are dormant

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in the winter and would not attenuate nitrogen in the river's water under these conditions. Thus nitrogen entering the water would accumulate in the downstream direction. Total Kjeldahl nitrogen and total phosphate values (Figures N2 and N3 respectively) remained low throughout the length of the river corridor during the winter.

Spring (05/03/88): All nutrient parameters were low in the spring probably as a result of the intense activity within the plant community and their ability to utilize nutrients.

Summer (07/20/89): The three nutrient parameters monitored in the summer (Figures N1, N2 and N3) all demonstrated anomalously high values at Pruitt (R3). The sampling location is upstream from Mill Creek and is not influenced by this tributary (Figure 1). This sample was associated with a rain event of 2 inches and the maximum turbidity (78 FTU) of any river station monitored on this date coincided with this sampling site (Appendix I). The crest of the run-off from the rain event was encountered at R3 and thus contained the highest ratio of run-off to base flow (ground water). The water running off the surrounding mountains and riparian fields accumulates nutrient material and washes it into the river. The higher the ratio of this surface water the higher the concentration of the nutrients in the river water.

Fall (11/18/88): The total Kjeldahl nitrogen occurred in relatively elevated concentrations in the fall when compared to the other seasons (Figure N2). Decaying leaf matter and a light rain combined may have resulted in the increased organically bound nitrogen component being washed into the river.

CONCLUSIONS

Buffalo National River encompasses 11 percent of the Buffalo River drainage basin. Of the remainder, 27% is National Forest and 61% is privately owned (Figure 4). The predominant land uses are timber and agriculture (cattle, hogs, chickens). Within BNR, fecal coliform concentrations attain maximum concentrations in association with agricultural operations. Boxley Valley, with its designation as a National Historic District and associated cattle farms, is one such area. Since WQM began in 1985, the river station (R2) at Ponca (Figure 1) has consistently shown the highest fecal coliform concentration of the nine river corridor stations. While the overall number of livestock grazing along the river has decreased since 1972, numbers in Boxley and Richland Valley have remained fairly static.

Two tributaries to the Buffalo River having greater than 10 square mile drainage basins also demonstrated fecal contamination as a result of agricultural activities in their watersheds. In 1988, Richland Creek became degraded for a period of two months showing both bacteria levels above state standards and elevated turbidity caused by excessive plant growth. In this case cattle depositing fecal material directly into the stream were responsible for the degradation. The source of the high fecal coliform levels at Tomahawk Creek is not as well understood because land use practices within that watershed have not been investigated.

Where the river or its tributaries drain agricultural areas, maximum fecal coliform levels are commonly associated with rainstorm run-off events. As much as 1500 col/100 ml has been recorded in the river corridor and 3000 col/100 ml in tributaries when sampling occurs in association with run-off events.

Turbidity values, under base flow conditions, are typically higher in the summer than any other time as a result of algae and phytoplankton growth. Turbidity also increases in association with run-off from rain events. This is a natural occurrence but can be amplified by anthropogenic activities. Dissolved oxygen remained near or above the level of saturation throughout the year almost without exception. Specific conductance values showed no significant anomalies and served to indicate the type and amount of ground water influencing BNR's tributaries and springs.

Nutrient parameters showed their highest concentrations in the summer (Table 26). The summer sampling corresponded to a 2 inch rain event in the upper and middle watershed. The elevated nutrient parameters reflect the effect of run-off on the water chemistry of the Buffalo River. The overall concentration of nutrients in the Buffalo River remains low. Metal parameters monitored by BNR were also low reflecting natural background conditions (Table 27).

RECOMMENDATIONS

Presently, BNR conducts intense monitoring in the summer and once a month on the river corridor during the rest of the year. The Hydrologic Technician is employed on a full-time basis during the summer and is employed on an intermittent status for the remainder of the year. Thus the Hydrologic Technician's time is consumed almost entirely by sampling and laboratory work in accordance with the sampling schedule outlined in the 1985 WQM plan (BNR, 1985). Each year, some aspect of the sampling schedule has not been met, impairing comparisons with previous years data. Entering data,

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writing reports, maintaining equipment, stream flow readings and following up on problem areas (such as Boxley Valley, Richland Creek and Tomahawk Creek) are not being given sufficient attention. For these reasons the resource management staff concur that a full time WQM position should be funded.

The second recommendation requires fulfillment of the first. BNR should take the steps necessary to comply with all EPA and Standard Methods guidelines and regulations regarding water quality analyses. Significant steps have been made in this direction, but complete compliance will require more time and effort on the part of the Hydrological Technician. A new WQM laboratory is being constructed in 1989 and will be an asset to quality control. Furthermore, a section of the revised BNR Water Quality Monitoring Plan (1989) should be developed describing the appropriate field and laboratory procedures designated by Standard Methods or the EPA.

Presently, nutrient and metals analyses are performed by contract. If the ability to perform nutrient analyses were incorporated into the new lab a full time Hydrological Technician could perform the appropriate analyses. The savings from the contract analysis and shipping would recoup the cost of the required laboratory equipment in two or three years. In addition, more in-depth monitoring and study could also be conducted on problem areas with nutrient analysis capabilities.

Another recommendation relates to the BNR's most pertinent water quality problem at this time, non-point pollution of surface and ground water associated with agricultural run-off. In several tributaries, and the river corridor, elevated bacteria levels are found whenever discharge is above base flow. Nutrient levels would also be expected to be higher under these conditions as demonstrated by the summer samples for 1988. A significant asset to the data presently collected as part of the WQM plan would be intensive studies of selected tributaries throughout the duration of a rainstorm event. Such studies would define the degree and timing of pollution influx. To better correlate water quality data with land use practices, the type and extent of land uses in individual drainages needs to be better defined. Currently only very imprecise estimates of land cover and use practices are available. In most areas even the numbers and duration of cattle grazing within BNR are not readily available. A first step would be a regular monthly or quarterly census of livestock within the park.

Given the number of recent tractor-trailer truck accidents on the six highways which cross the river, the BNR WQM program should work to improve its capability to monitor the impact of hazardous materials spilled in or near the river. BNR currently maintains

enough absorbent spill materials to make an initial response and attempt to contain the spread of materials. The Resource Management and Visitor Protection staff should develop a preplan to deal with both spill containment and follow-up monitoring of water resources. A suggested completion date would be the end of 1990.

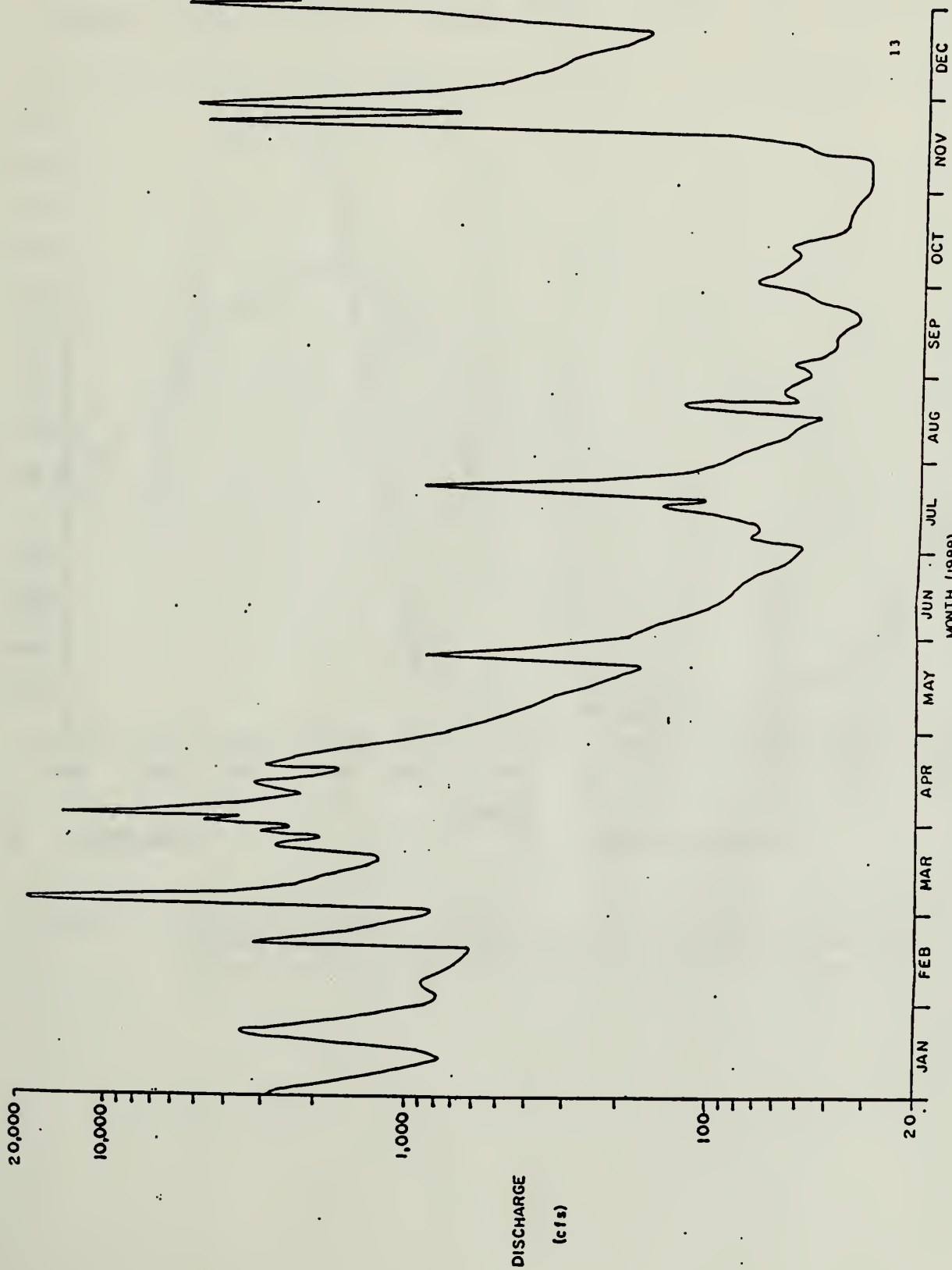


Figure 2: Stream hydrograph, Buffalo National River, Highway # 65 Bridge.

MEAN DISCHARGE DATA FOR 1988 VS HISTORY

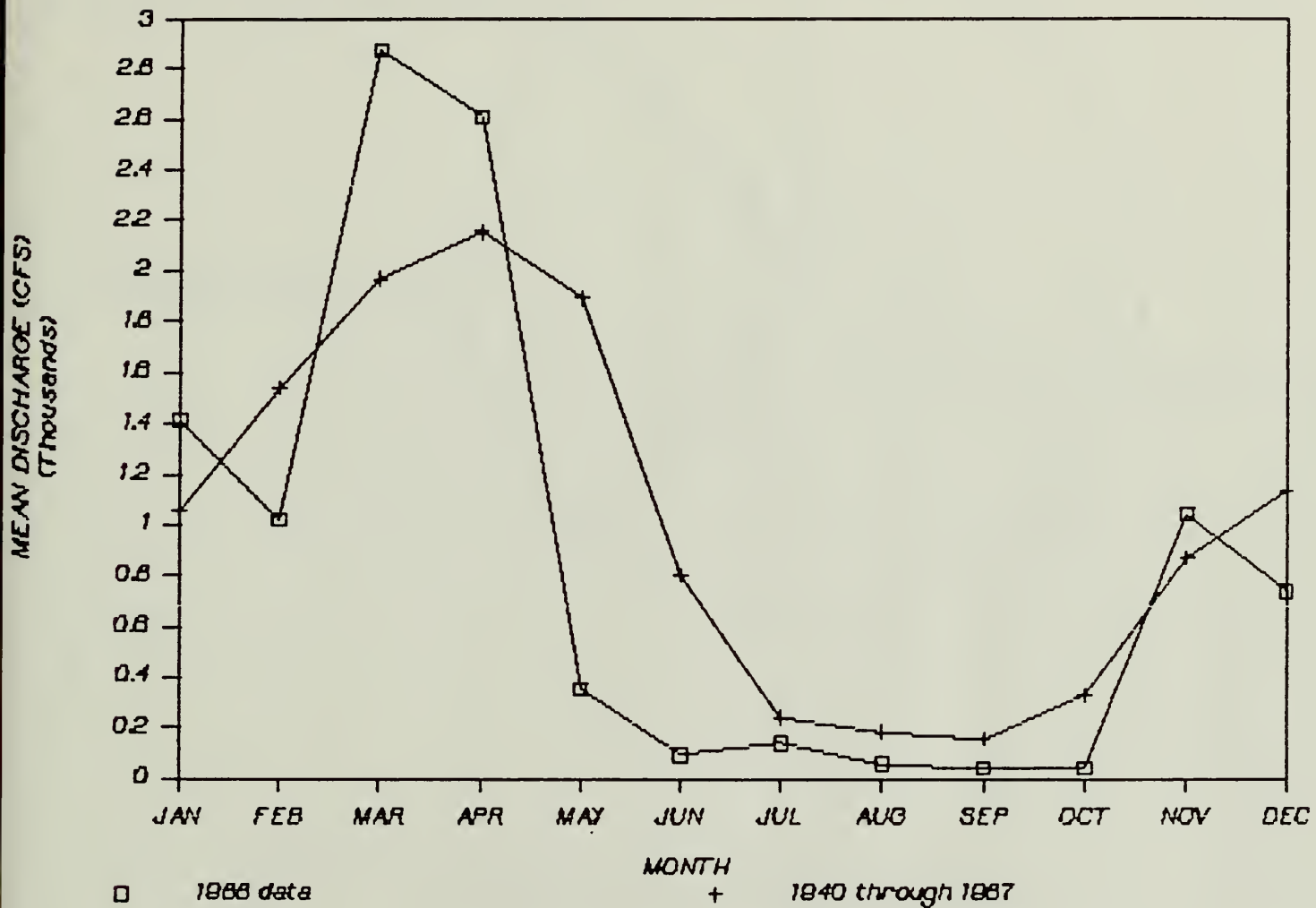


Figure 3: Mean discharge (1988) vs. historic mean discharge (1940-1987). Data provided by the USGS from the discharge station at Hwy 65 near St. Joe, AR.

BUFFALO RIVER WATERSHED BREAKDOWN

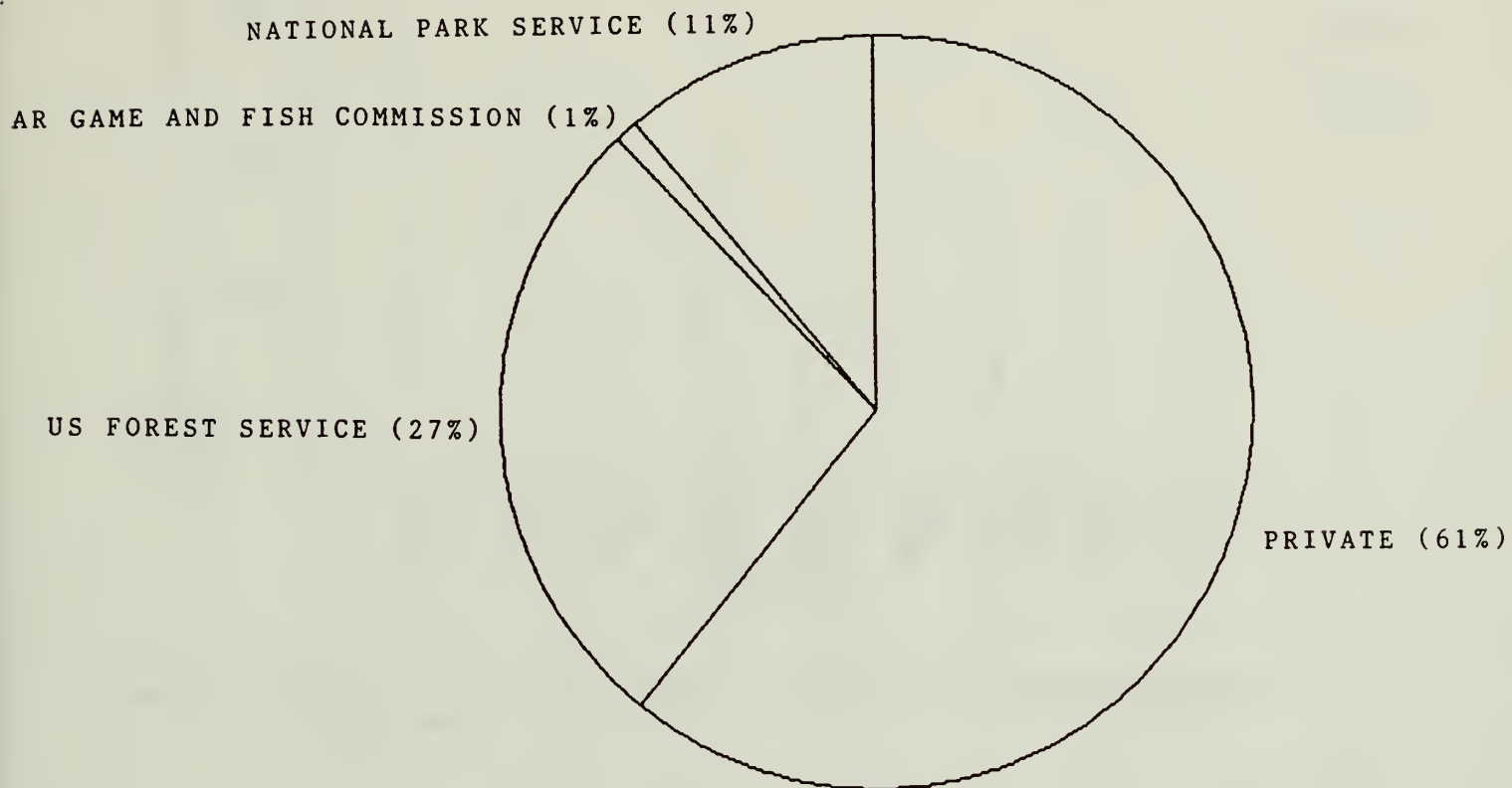


Figure 4: Percentage of the Buffalo River's watershed owned by government agencies and under private control.

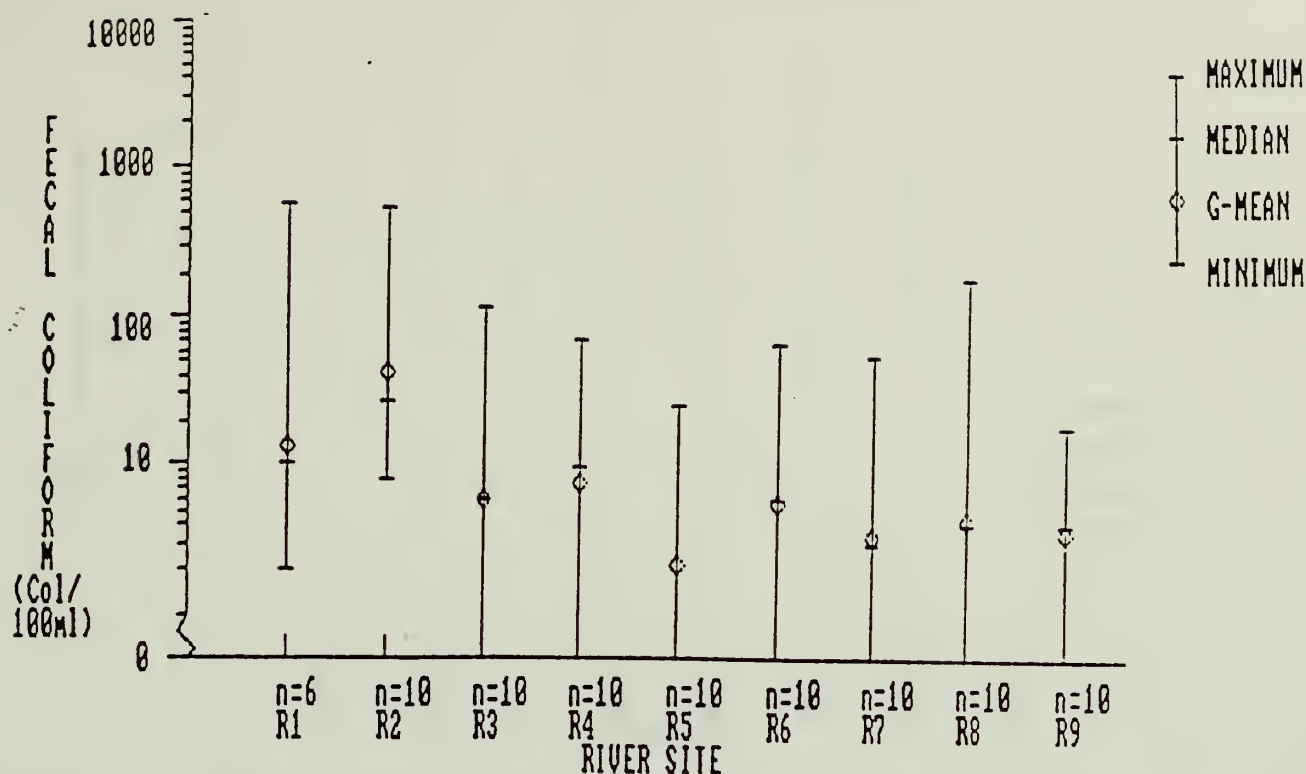


Figure A1: Fecal coliform statistics at the nine river corridor sampling sites, 1988.

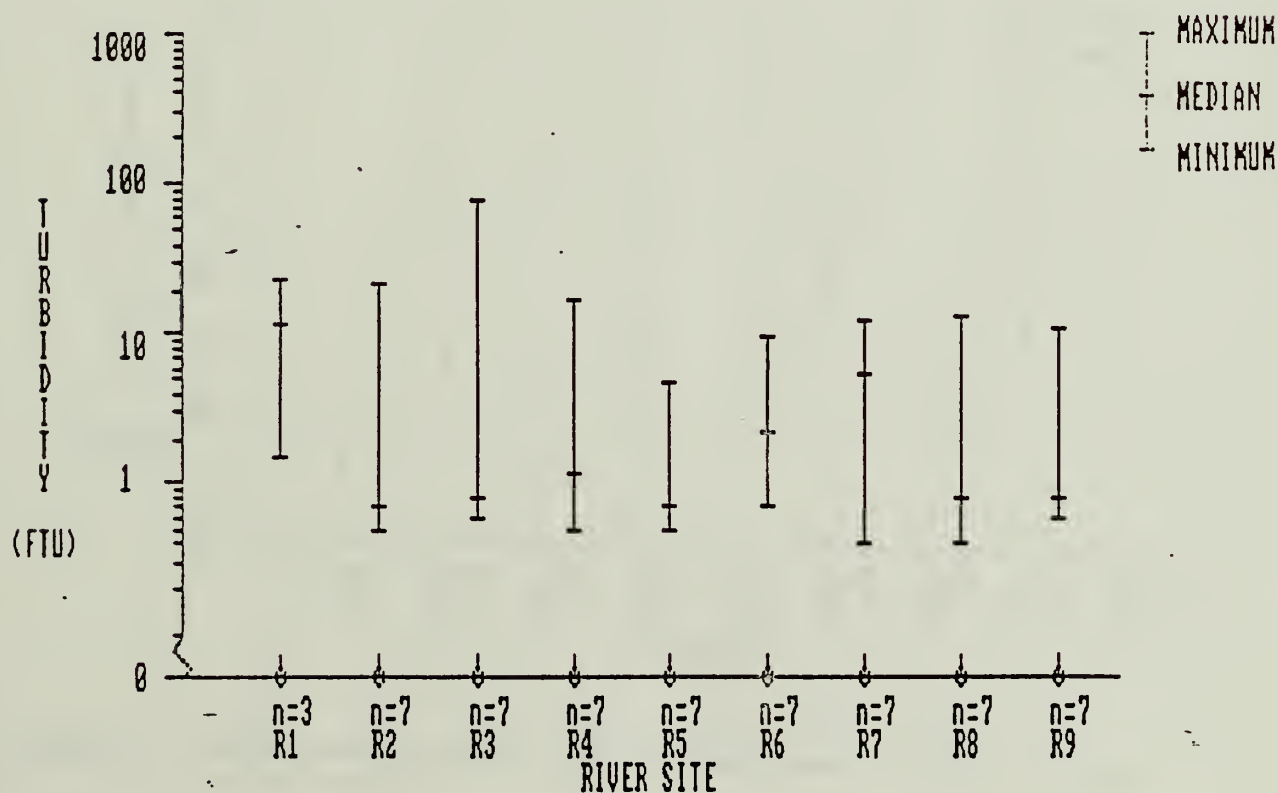


Figure A2: Turbidity statistics at the nine river corridor sampling sites, 1988.

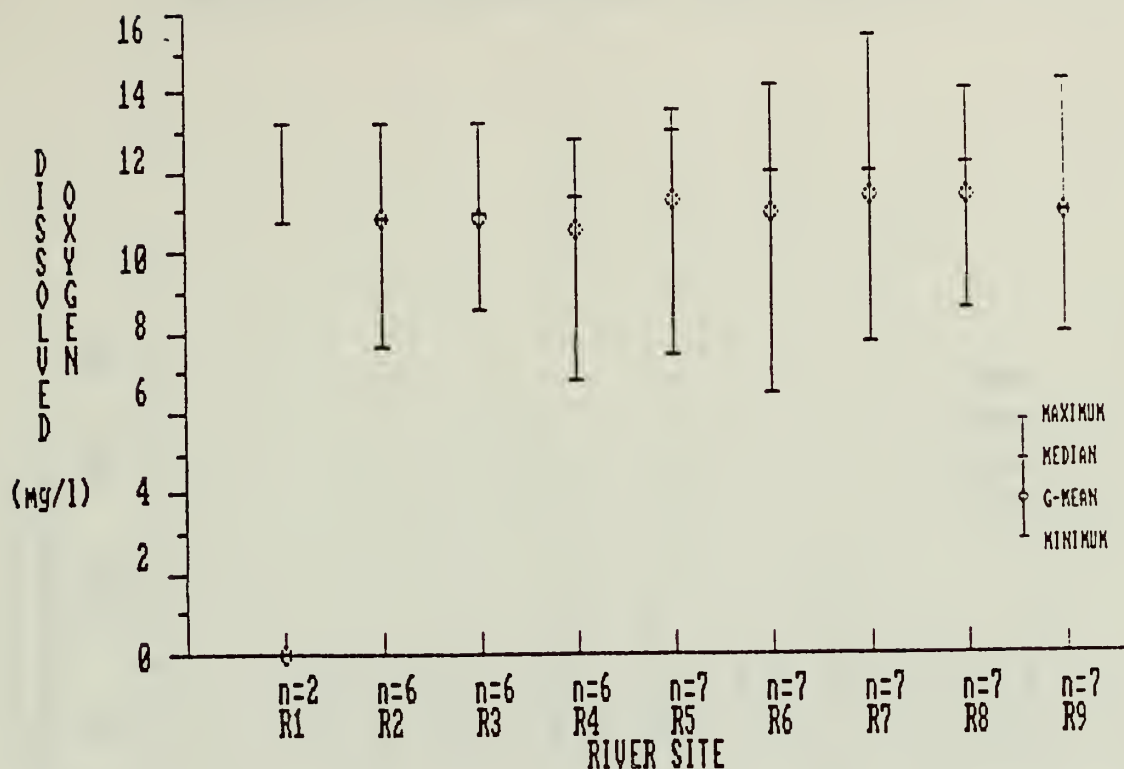


Figure A3: Dissolved oxygen statistics at the nine river corridor sampling sites, 1988.

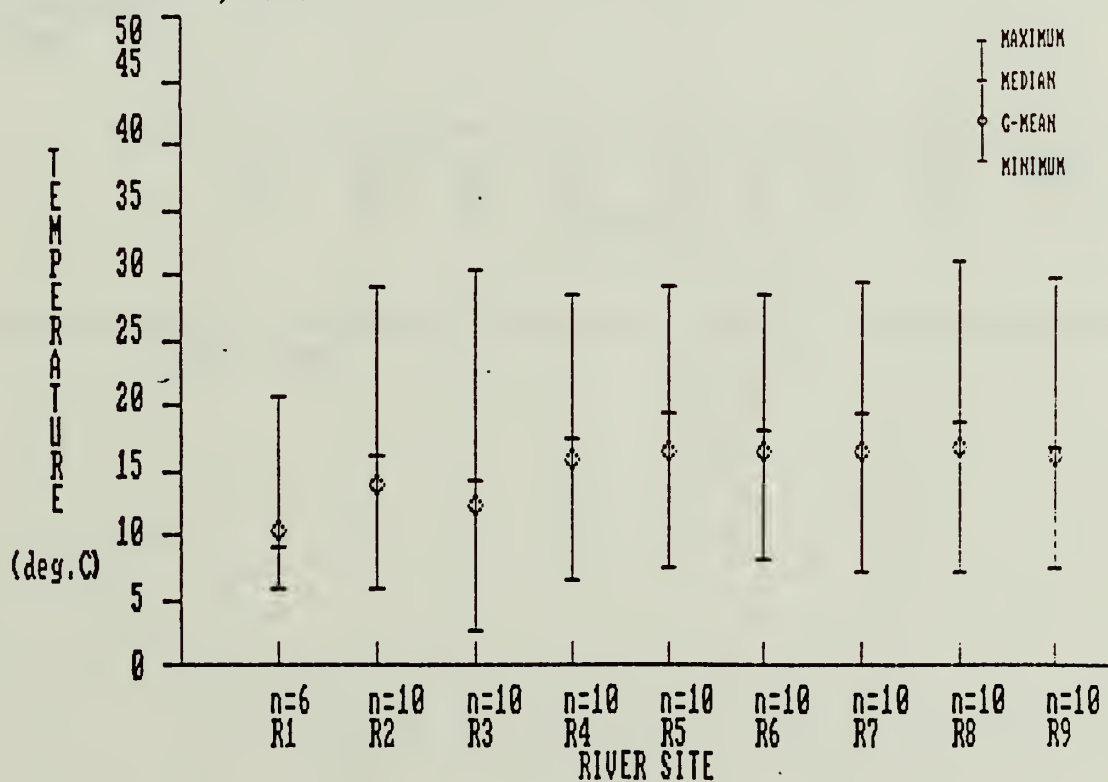


Figure A4: Temperature statistics at the nine river corridor sampling sites, 1988.

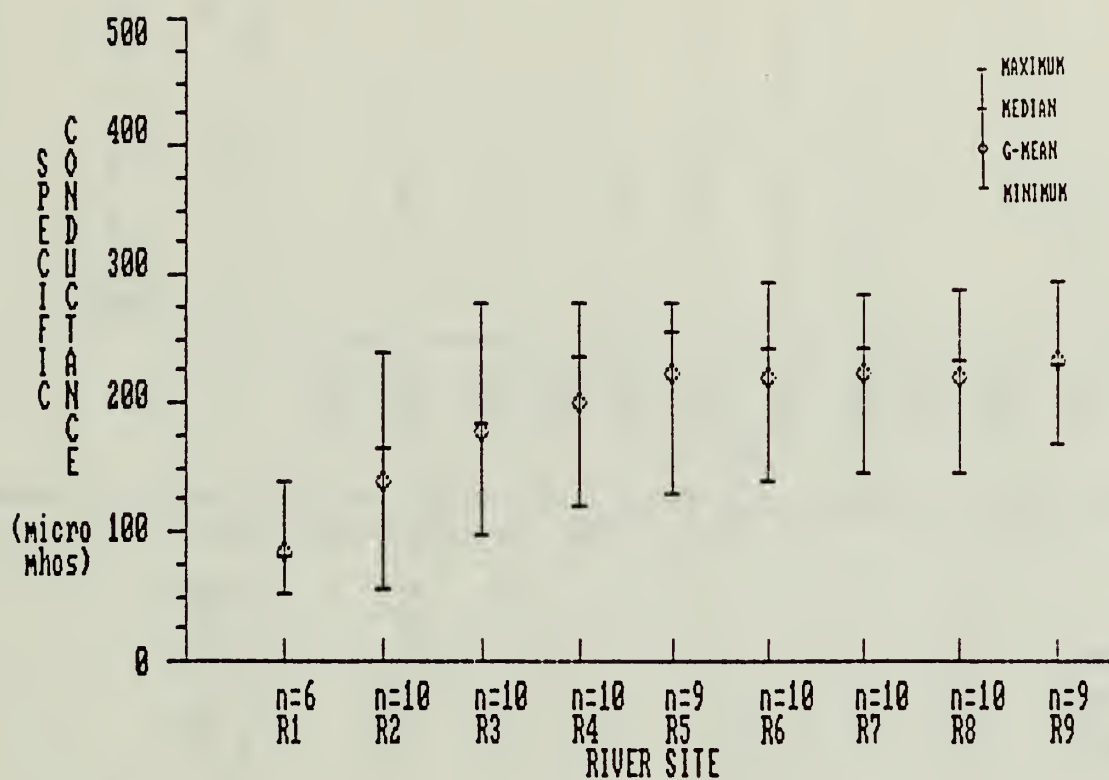


Figure A5: Specific conductance statistics at the nine river corridor sampling sites, 1988.

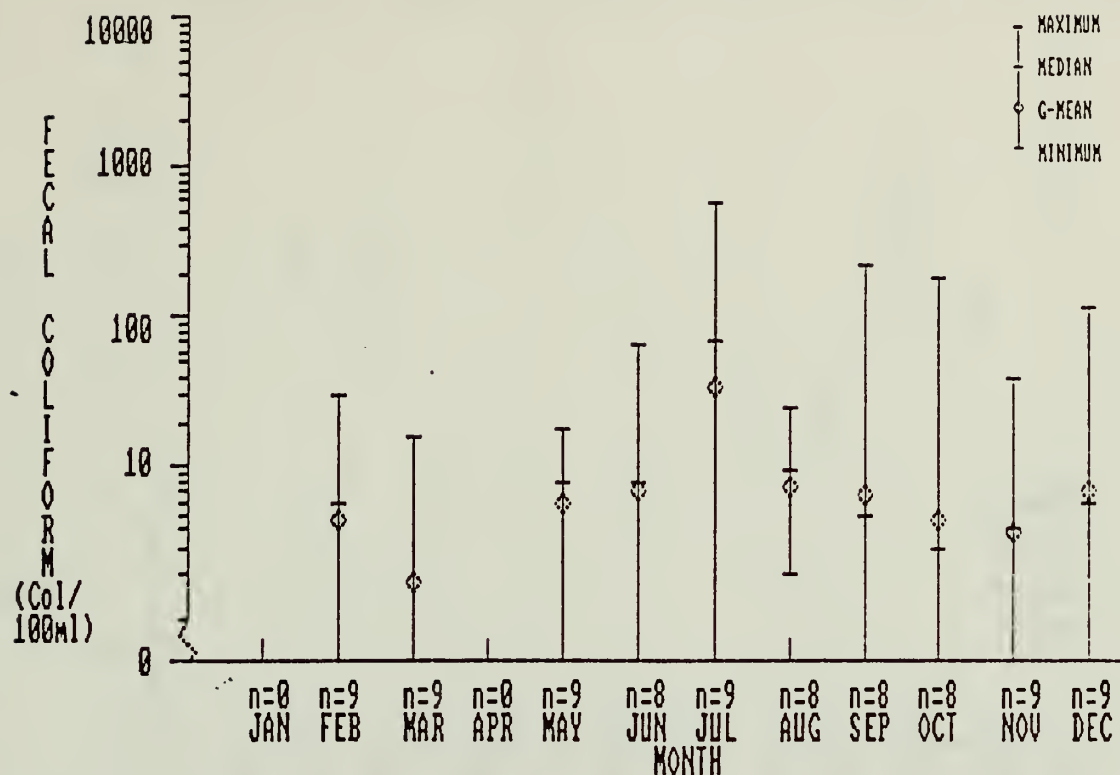


Figure B1: Fecal coliform statistics by month collected at the nine river corridor sampling sites, 1988.

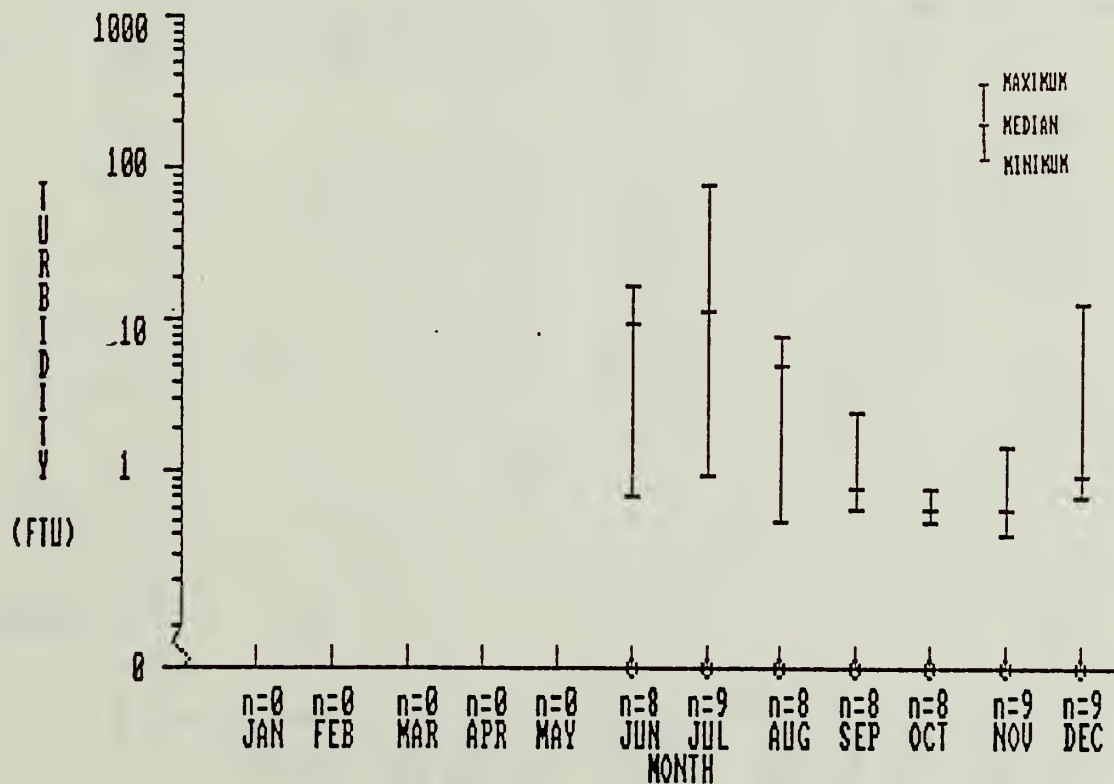


Figure B2: Turbidity statistics by month collected at the nine river corridor sampling sites, 1988.

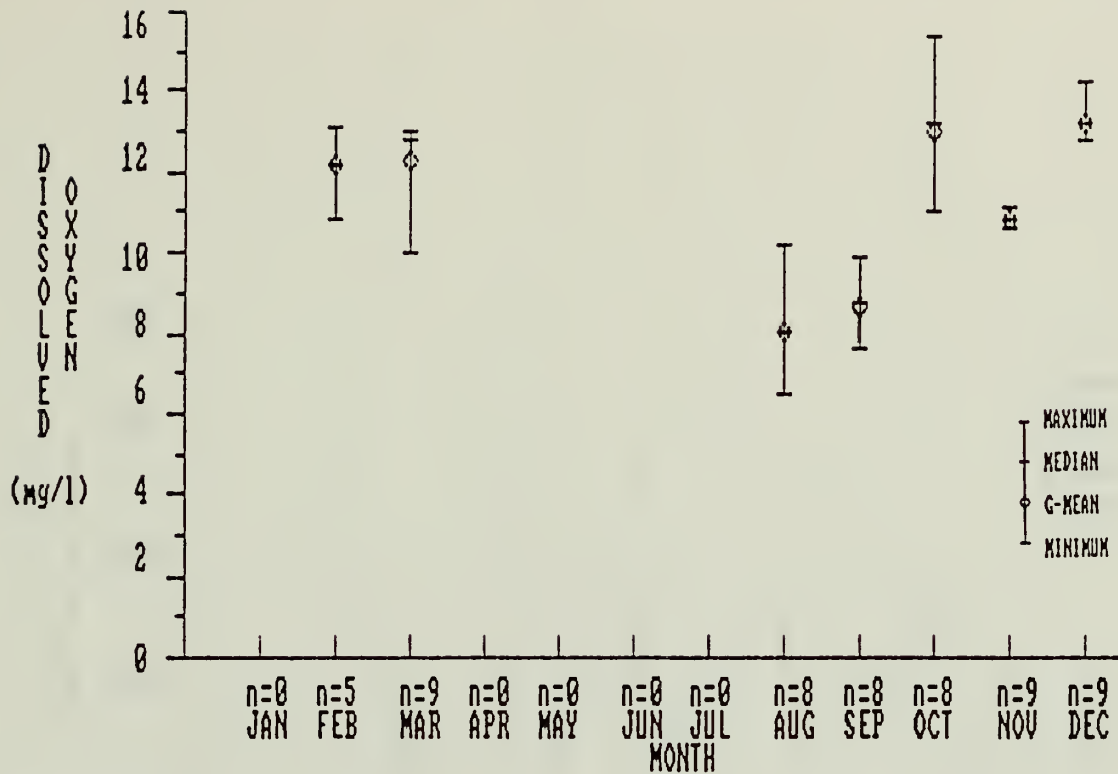


Figure B3: Dissolved oxygen statistics by month collected at the nine river corridor sampling sites, 1988.

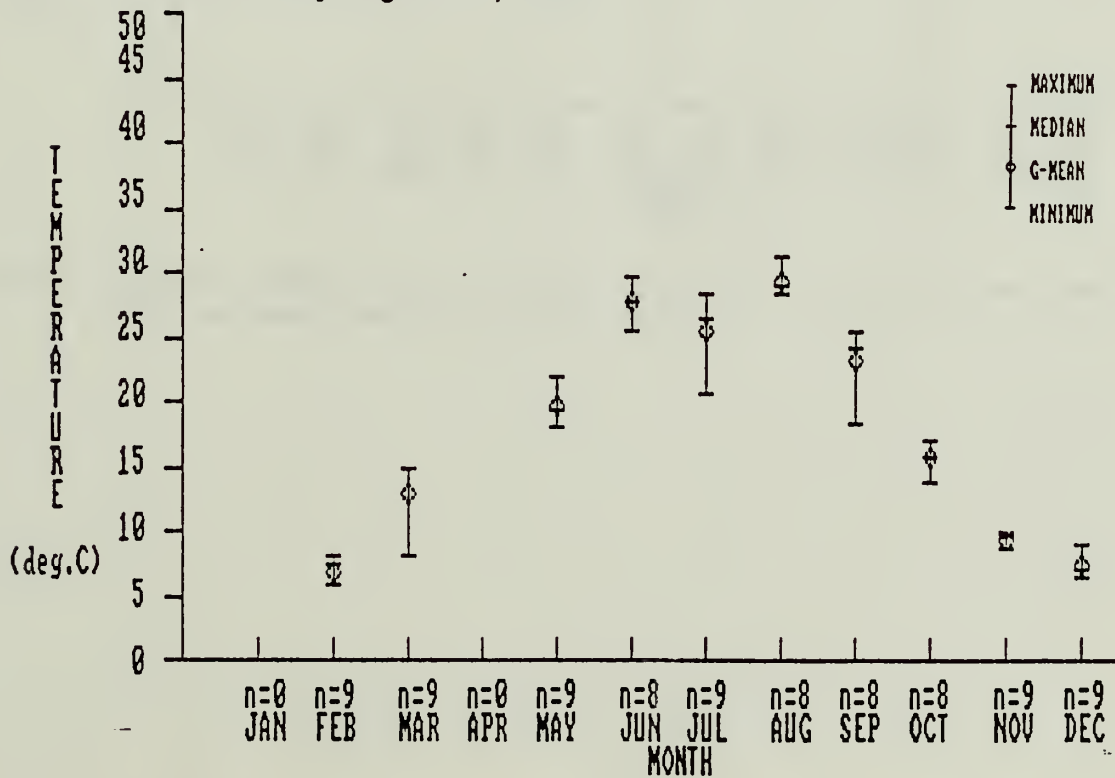


Figure B4: Temperature statistics by month collected at the nine river corridor sampling sites, 1988.

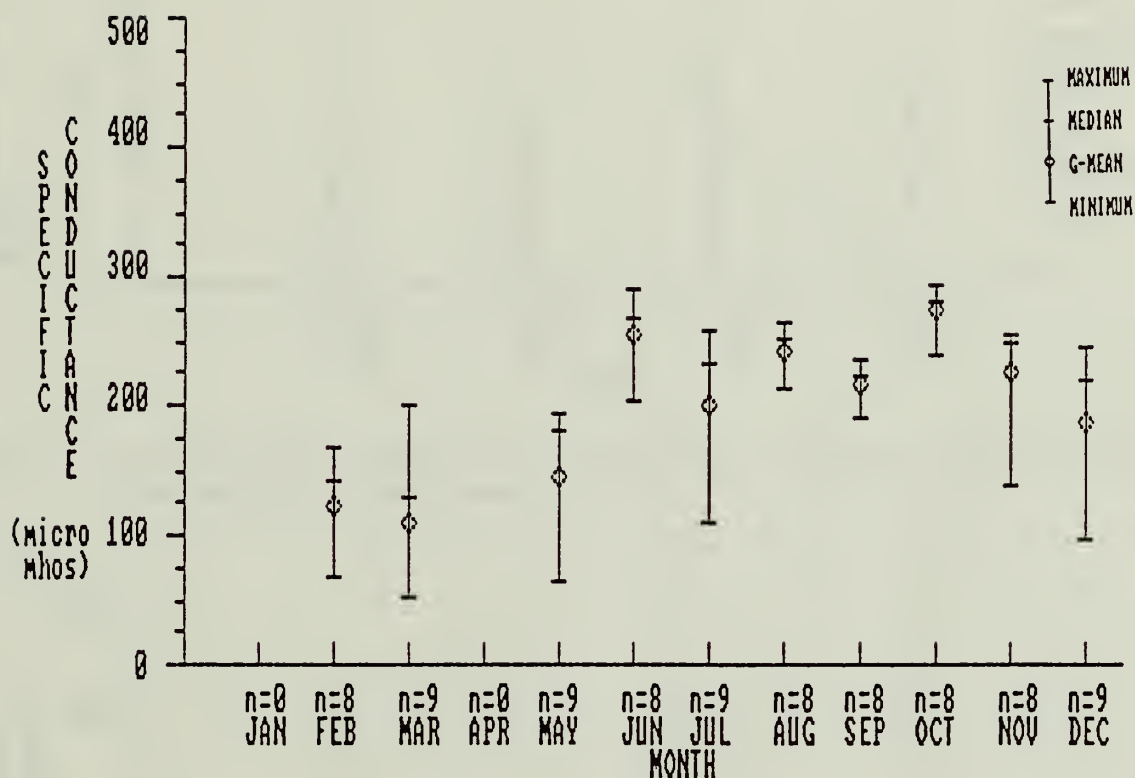


Figure B5: Specific conductance statistics by month collected at the nine river corridor sampling sites, 1988.

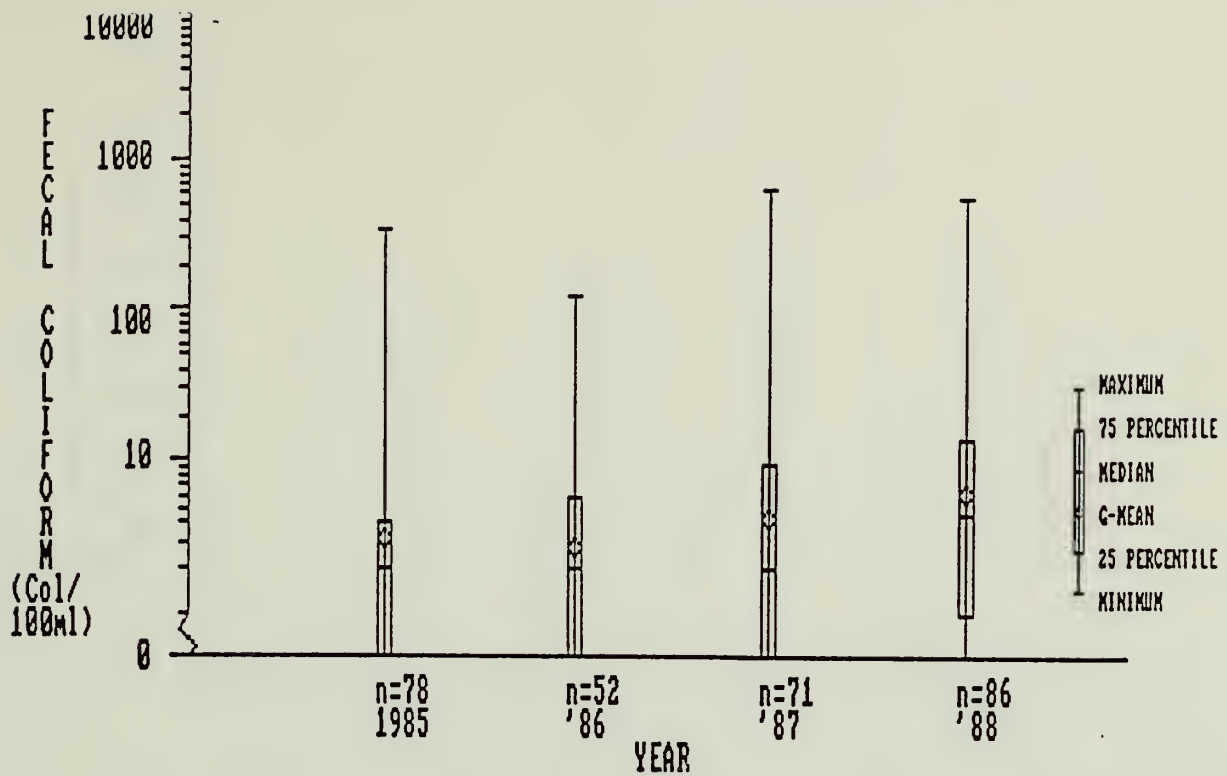


Figure C1: Fecal coliform statistics for the river corridor, 1985-1988 (all nine sampling sites lumped)

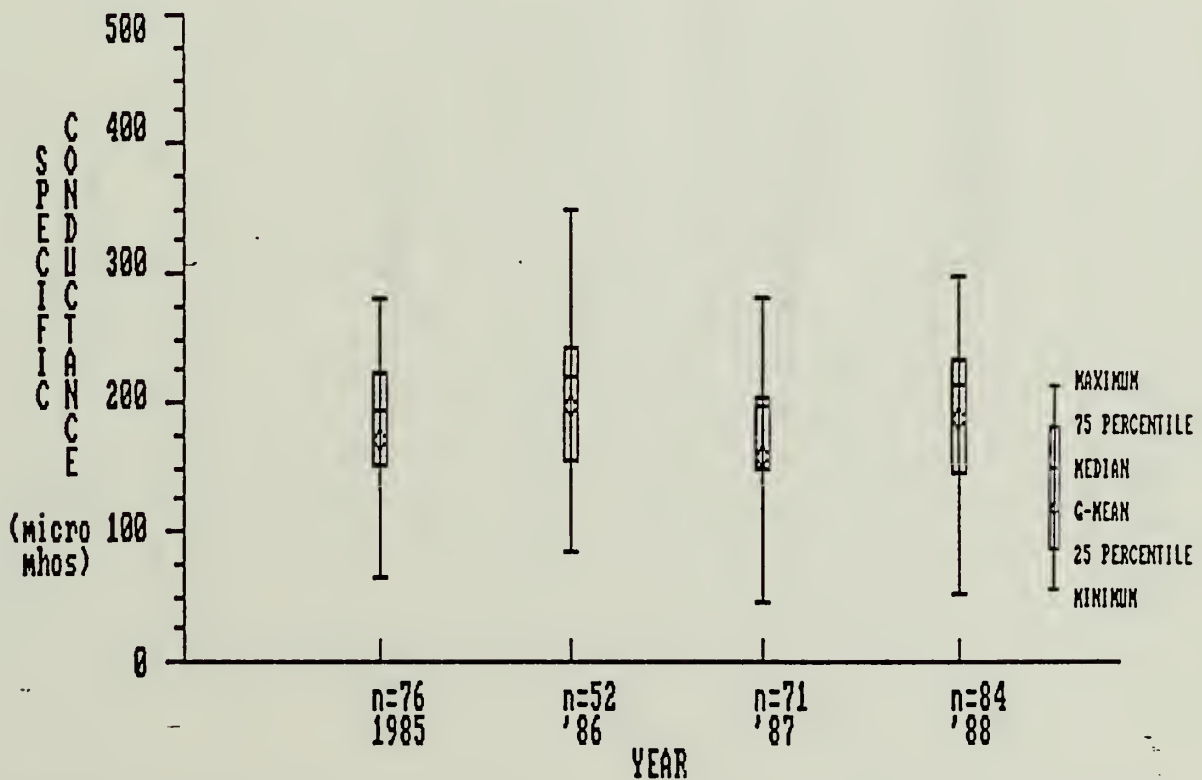


Figure C2: Specific conductance statistics for the river corridor, 1985-1988 (all nine sampling sites lumped)

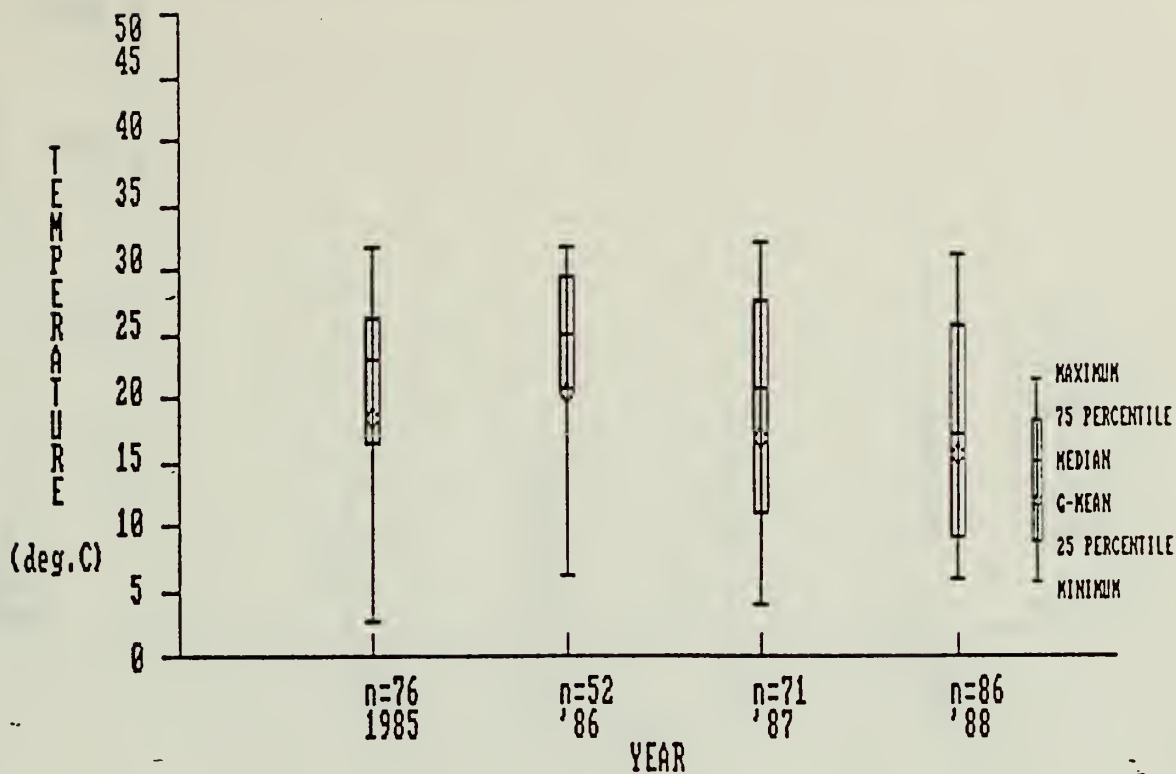


Figure C3: Temperature statistics for the river corridor, 1985-1988 (all nine sampling sites lumped)

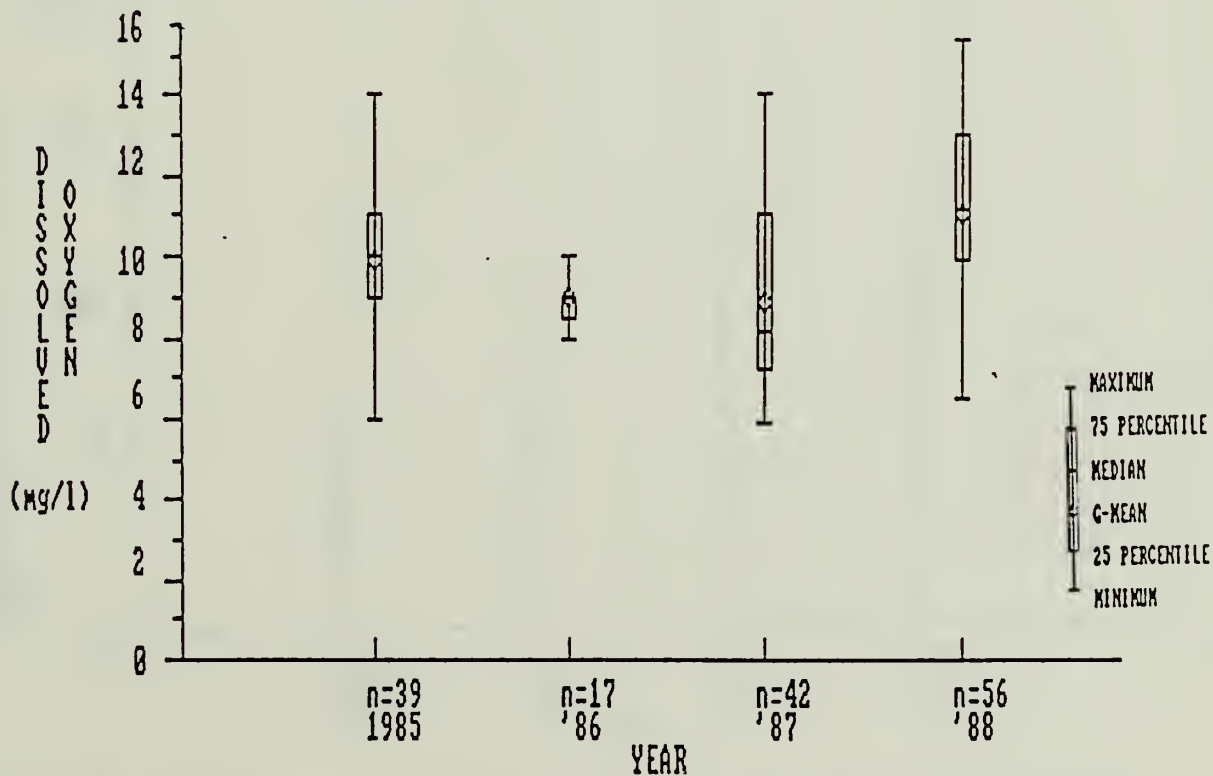


Figure C4: Dissolved oxygen statistics for the river corridor, 1985-1988 (all nine sampling sites lumped)

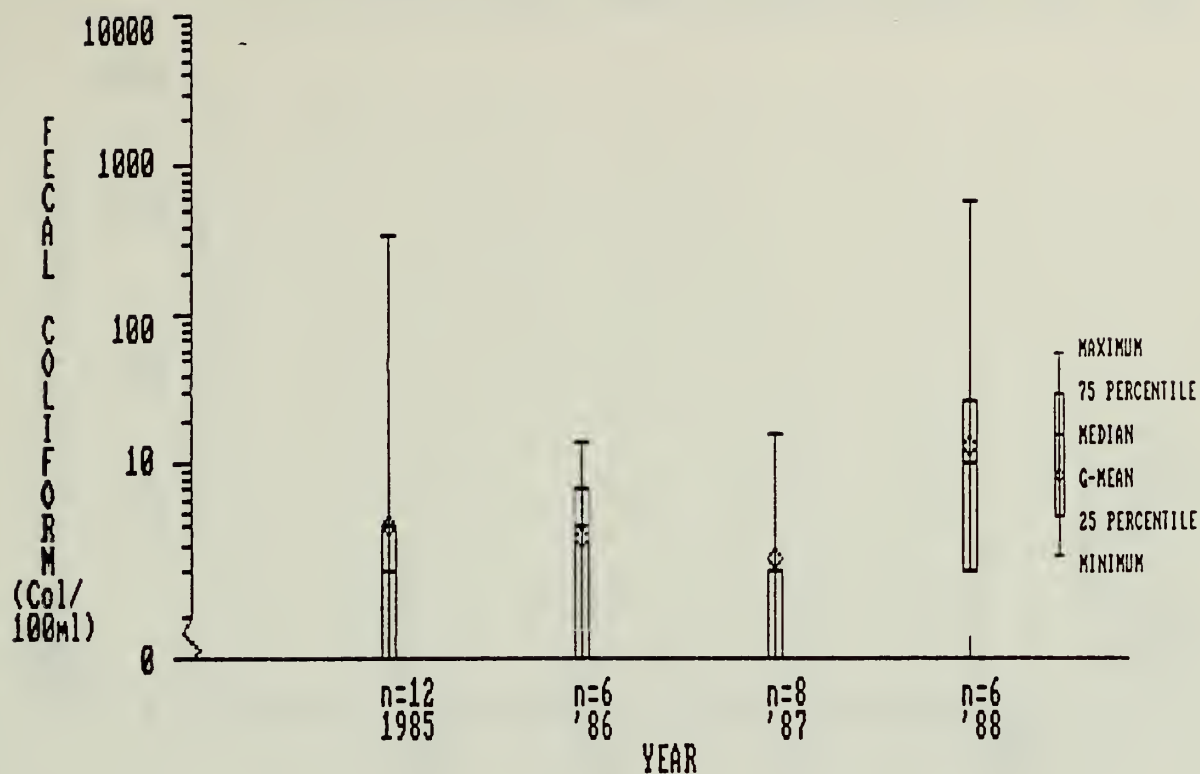


Figure D1: Fecal coliform statistics for the years 1985-1988 at site R1.

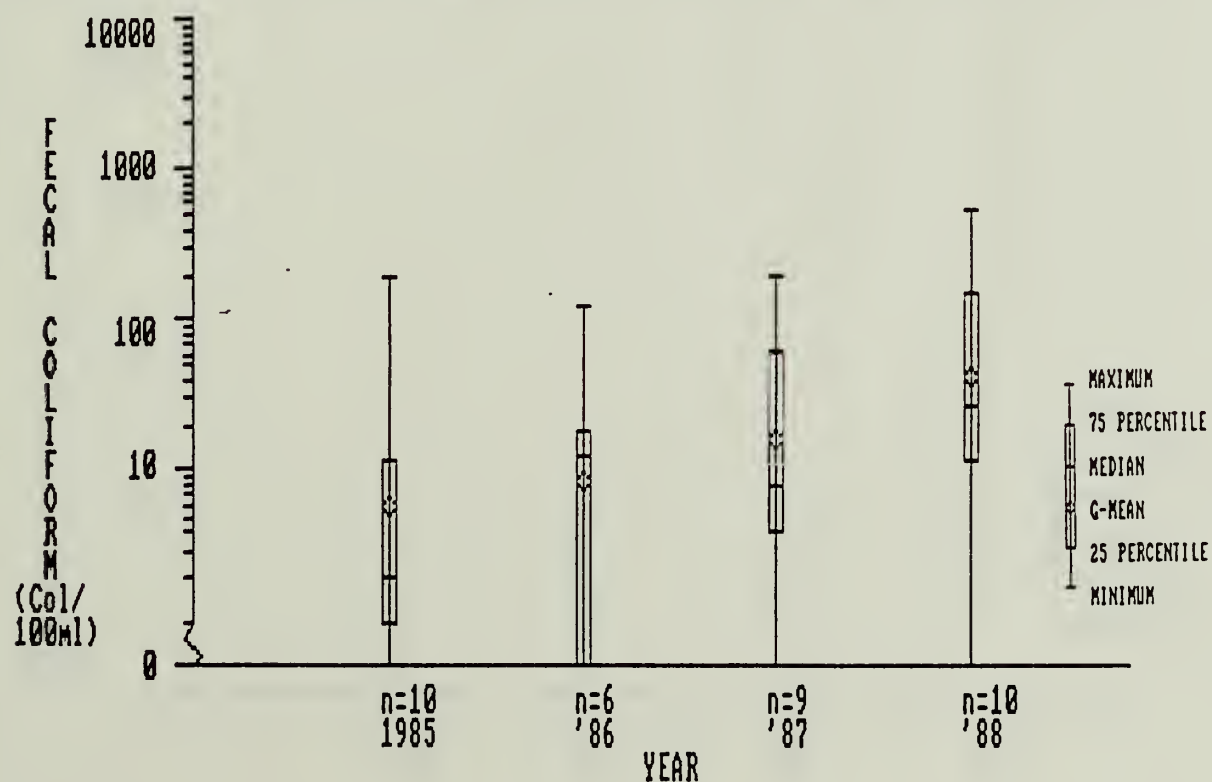


Figure D2: Fecal coliform statistics for the years 1985-1988 at site R2.

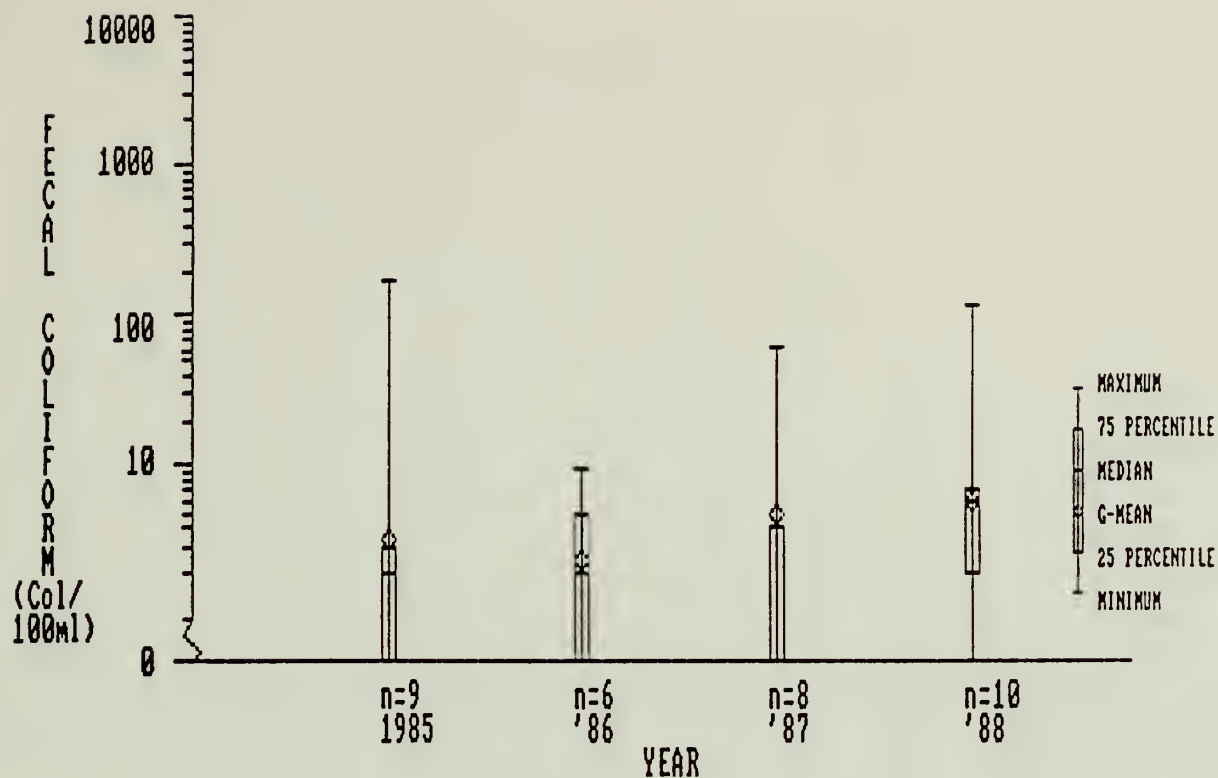


Figure D3: Fecal coliform statistics for the years 1985-1988 at site R3.

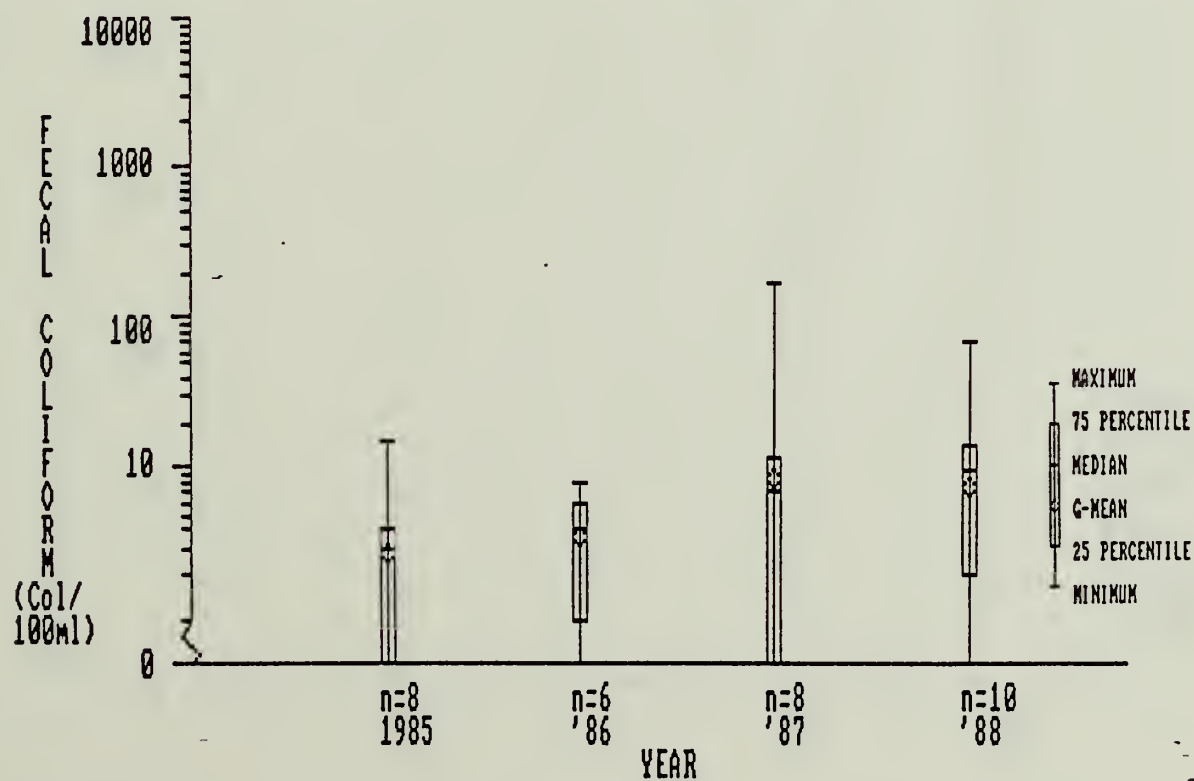


Figure D4: Fecal coliform statistics for the years 1985-1988 at site R4.

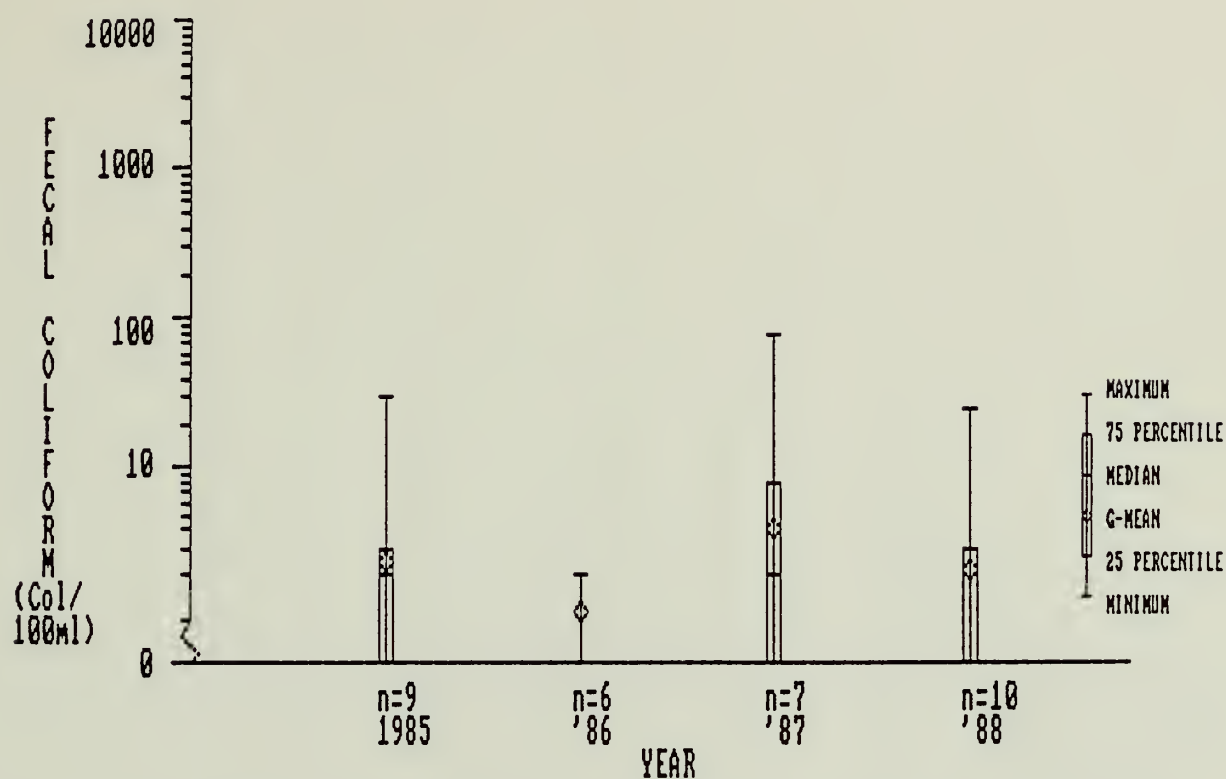


Figure D5: Fecal coliform statistics for the years 1985-1988 at site R5.

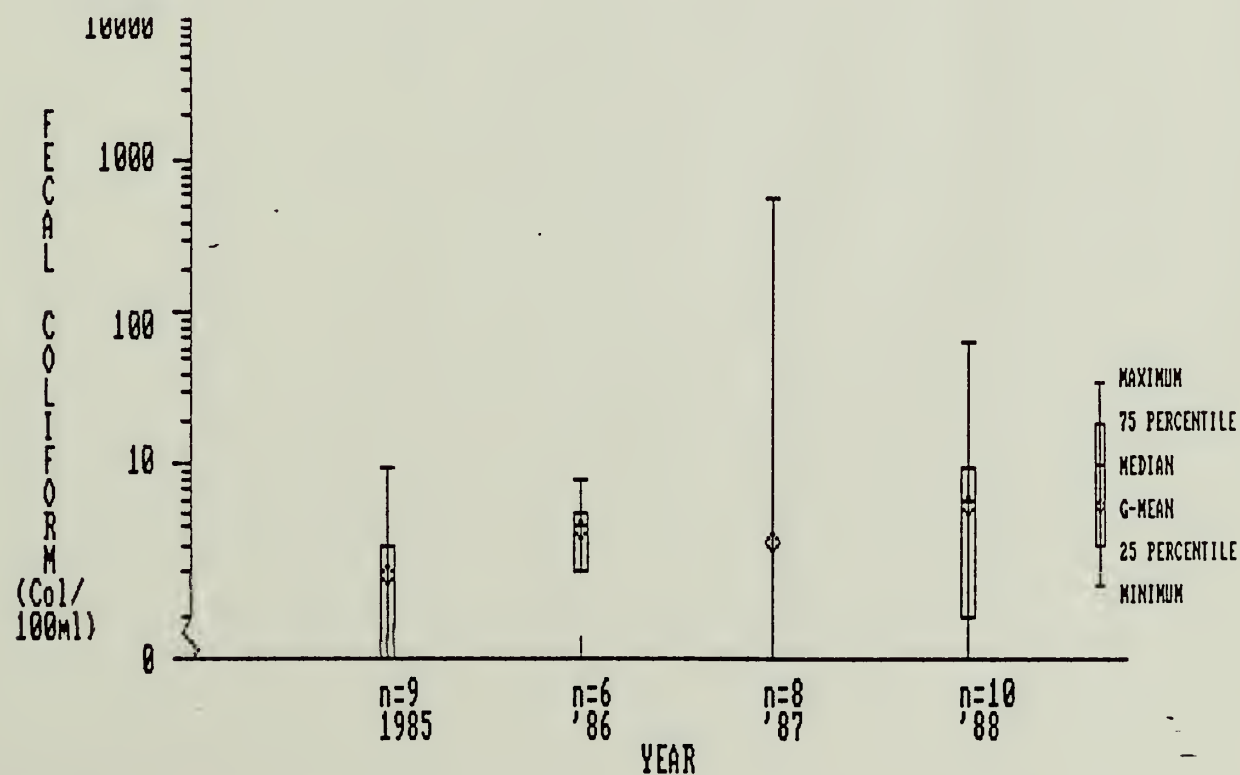


Figure D6: Fecal coliform statistics for the years 1985-1988 at site R6.

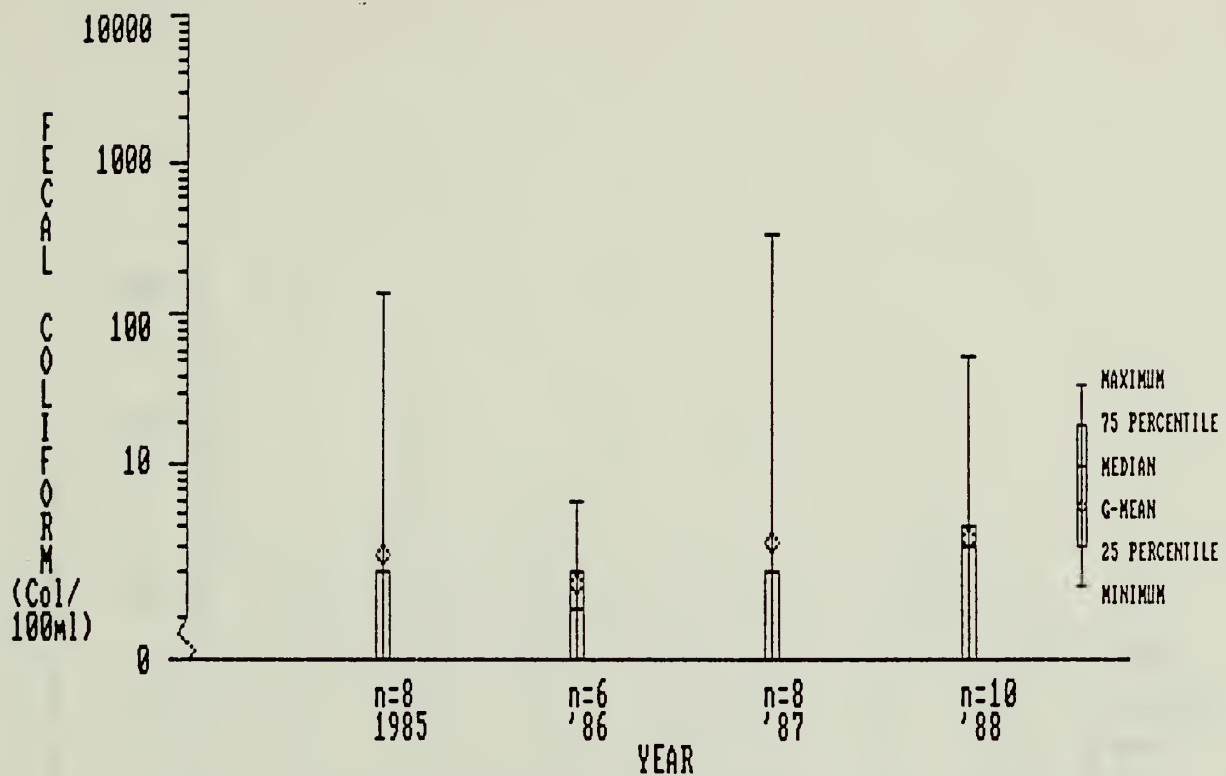


Figure D7: Fecal coliform statistics for the years 1985-1988 at site R7.

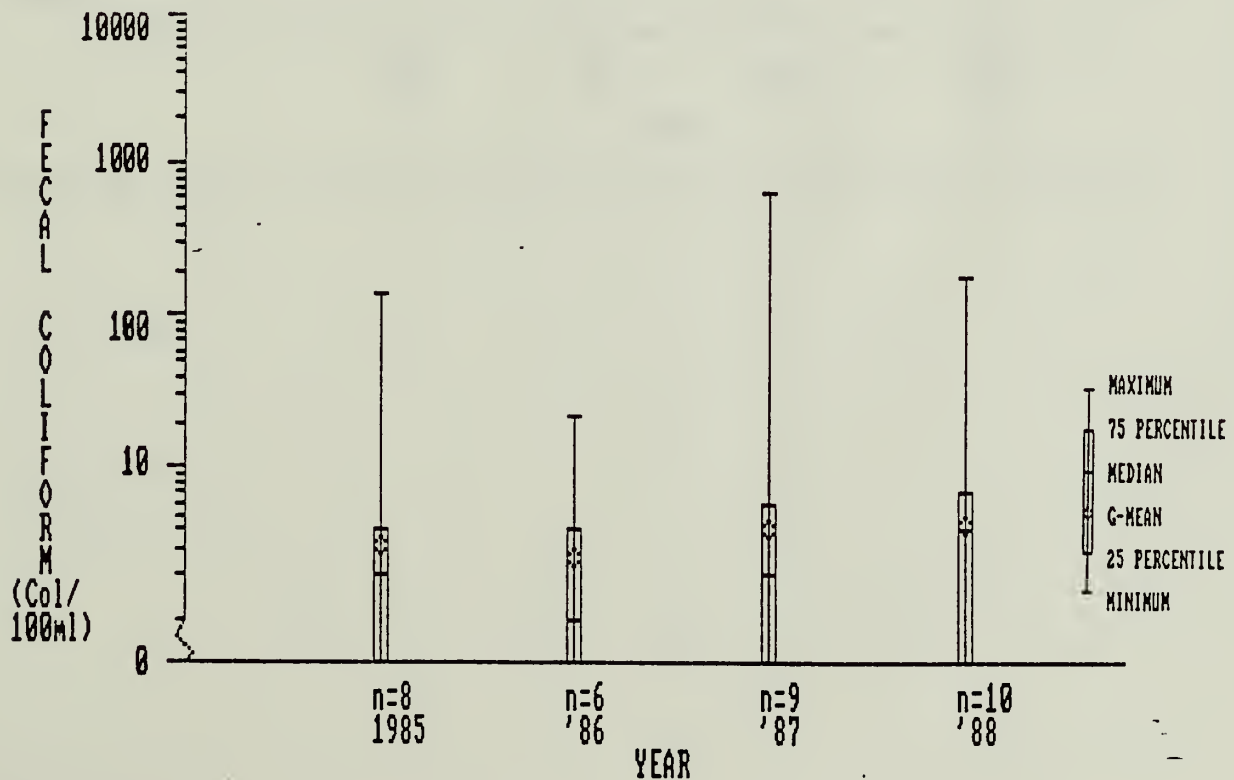


Figure D8: Fecal coliform statistics for the years 1985-1988 at site R8.

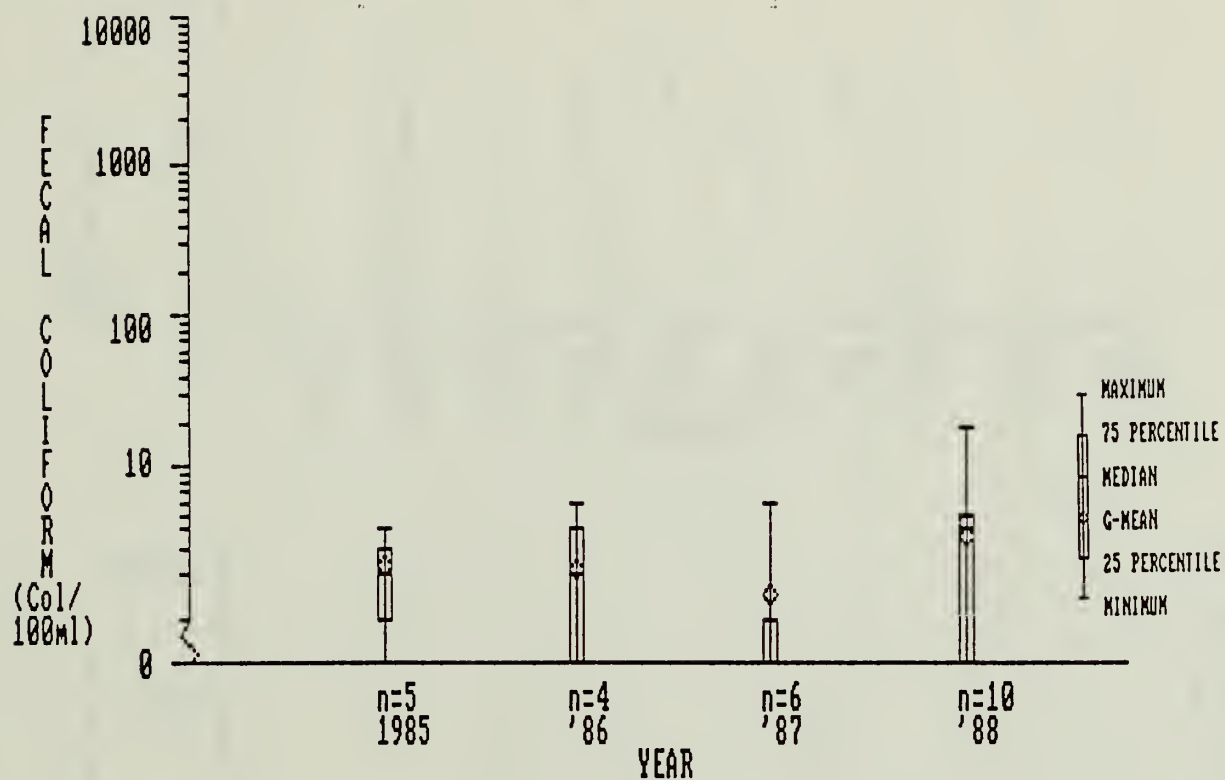


Figure D9: Fecal coliform statistics for the years 1985-1988 at site R9.

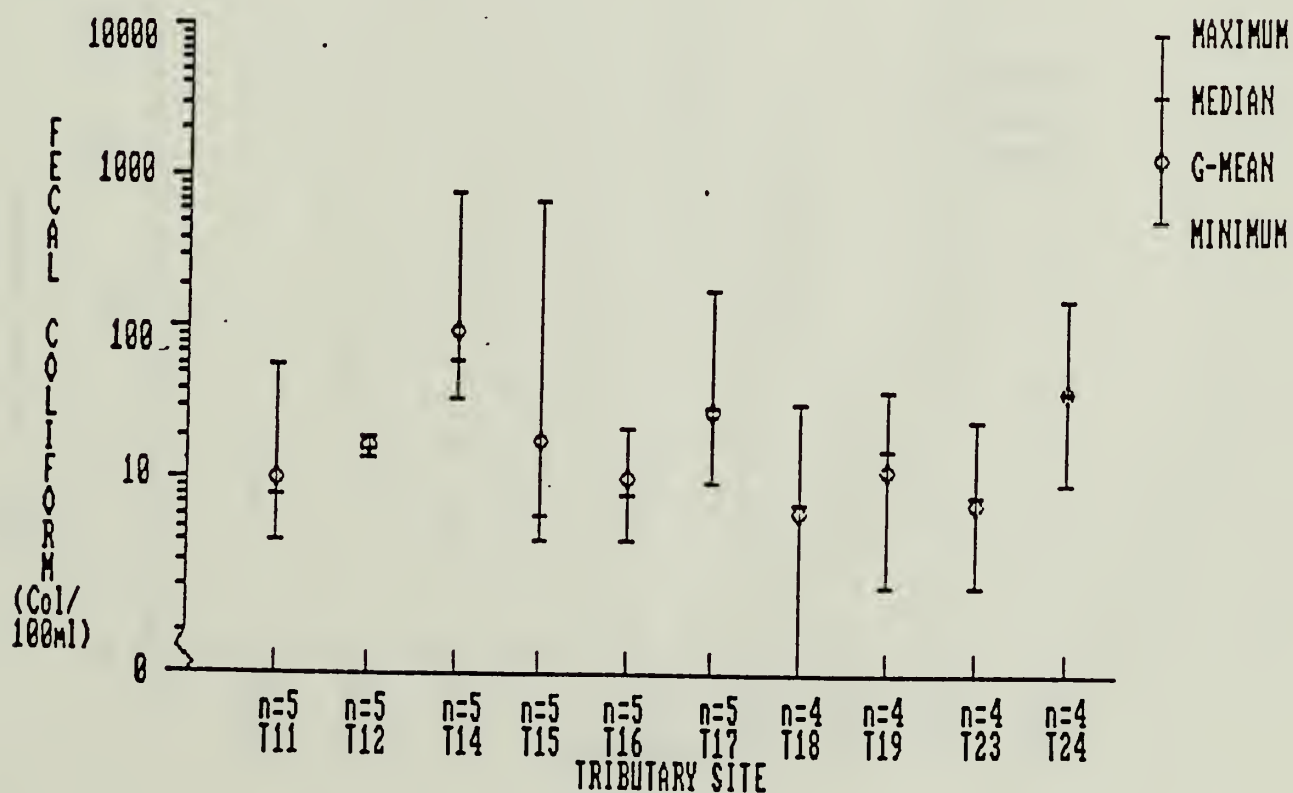
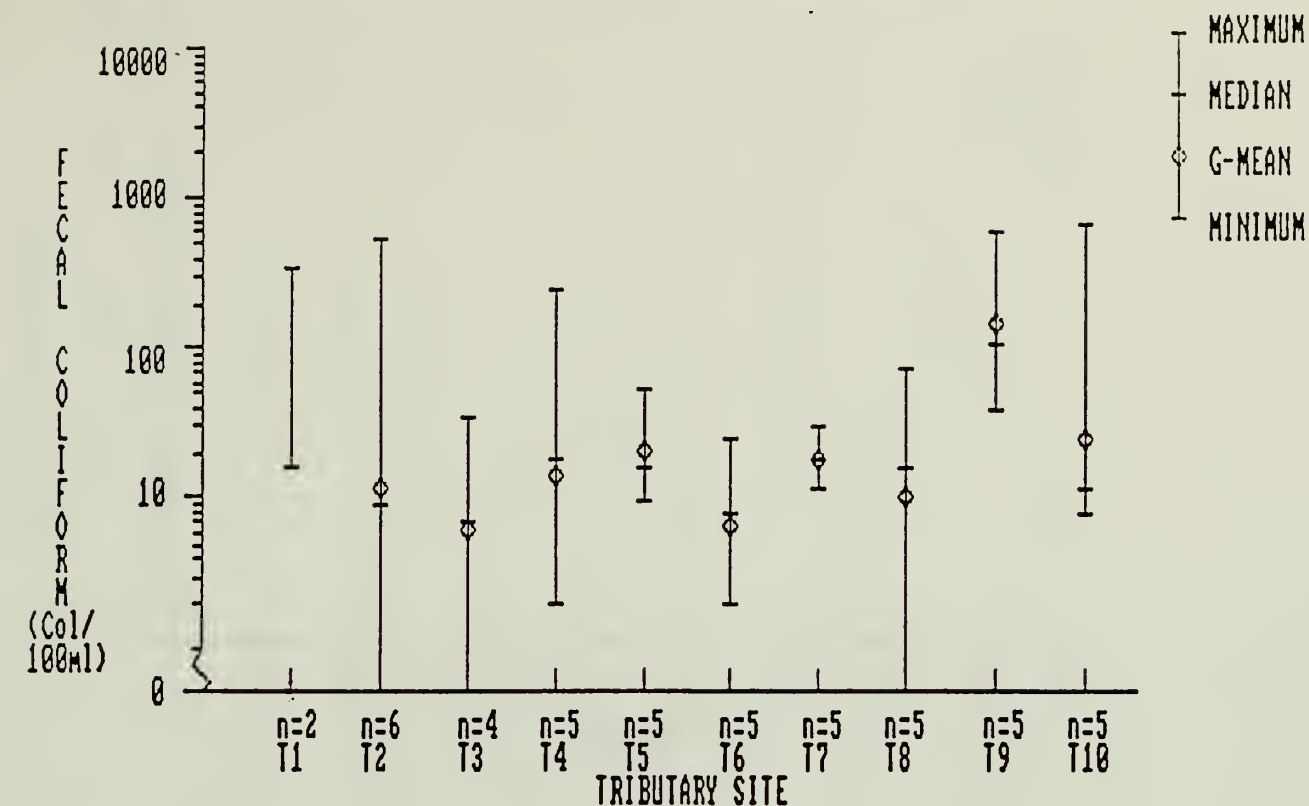


Figure E1: Fecal coliform statistics at 20 tributary sampling sites, 1988.

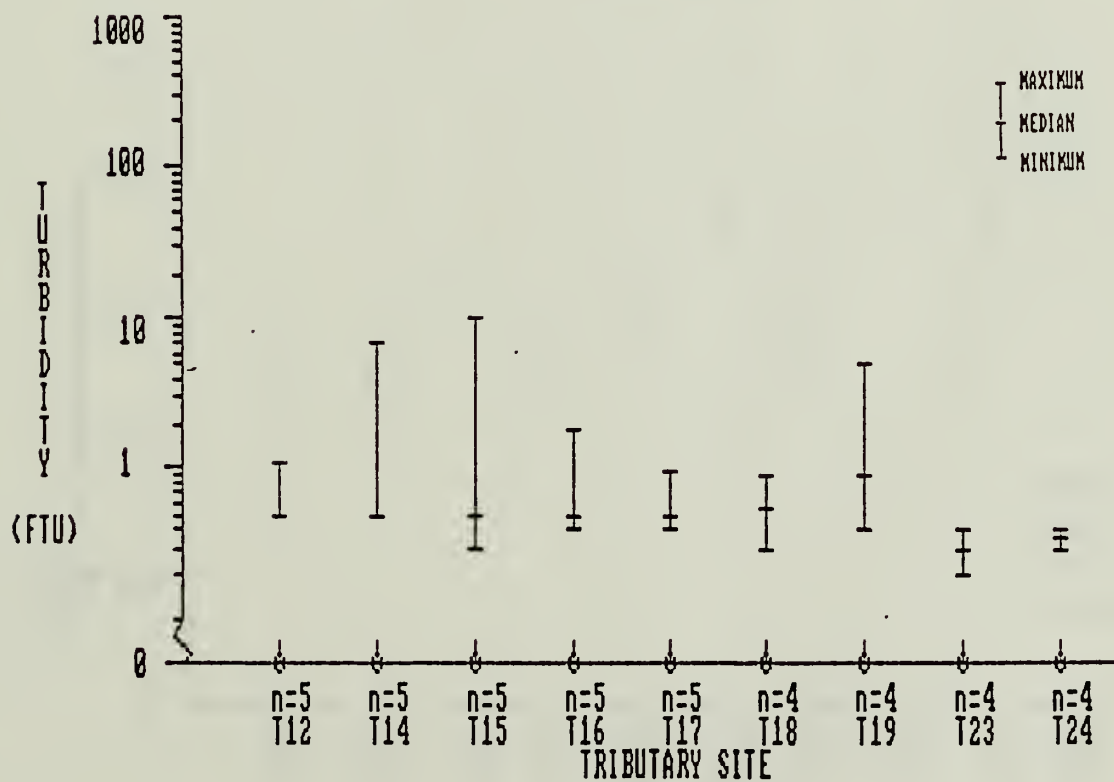
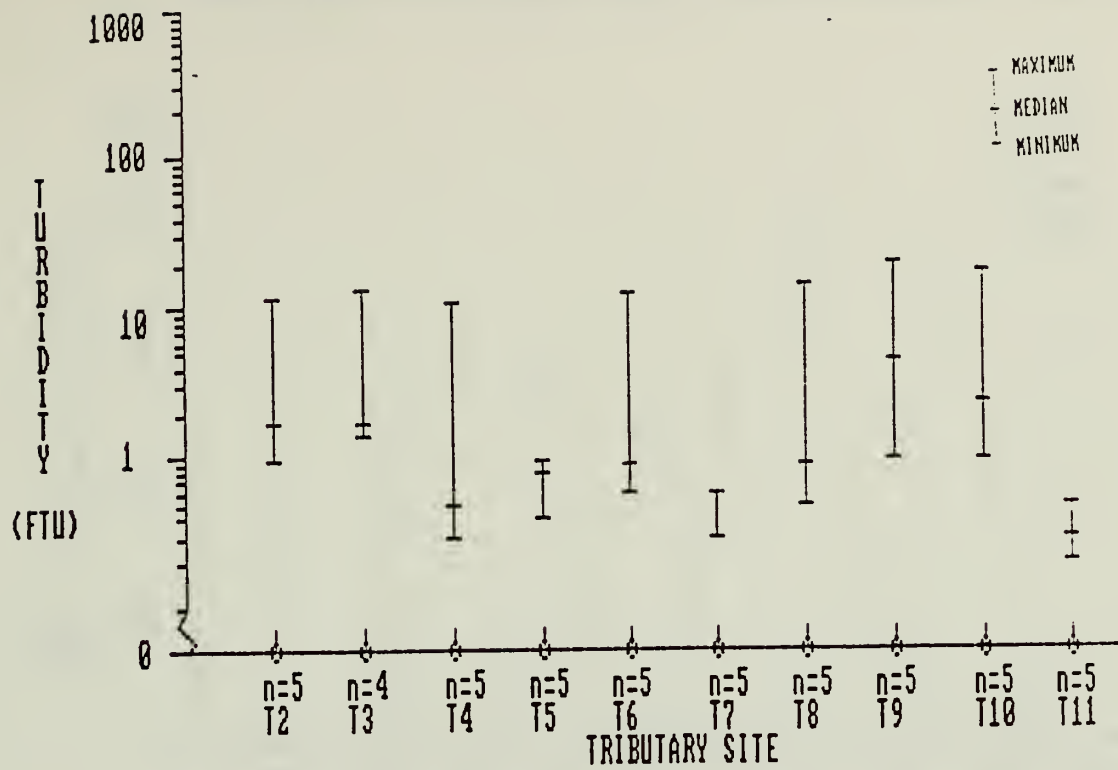


Figure E2: Turbidity statistics at 20 tributary sampling sites, 1988.

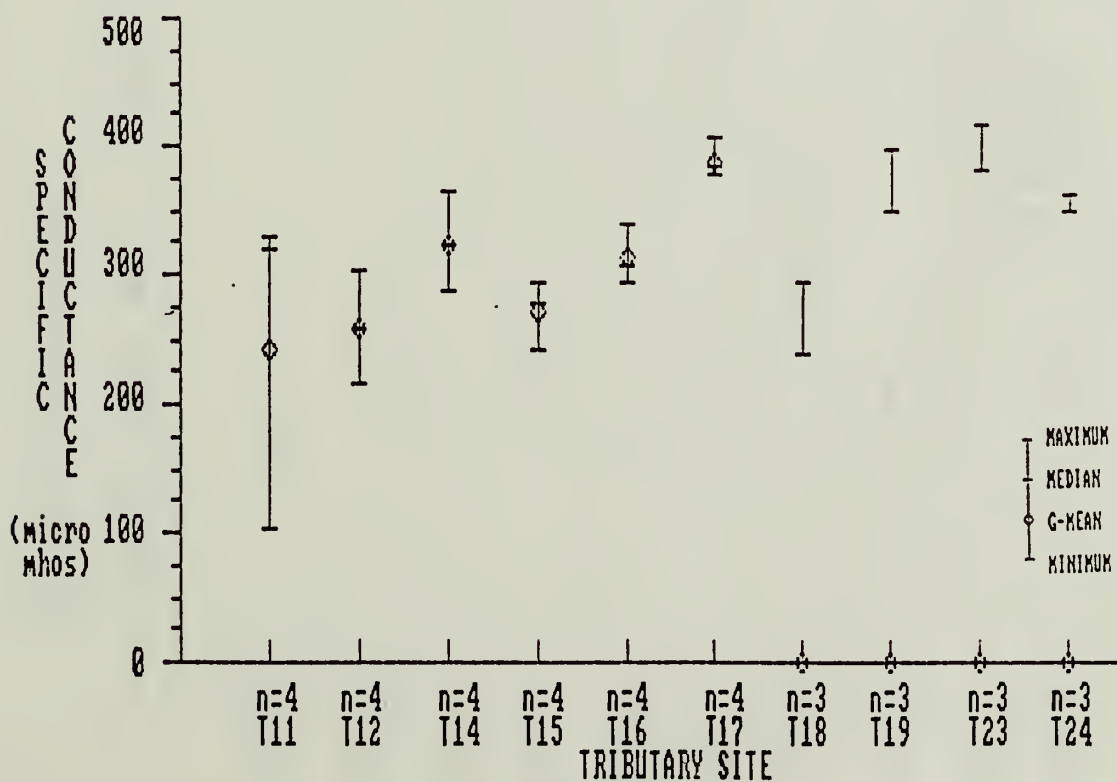
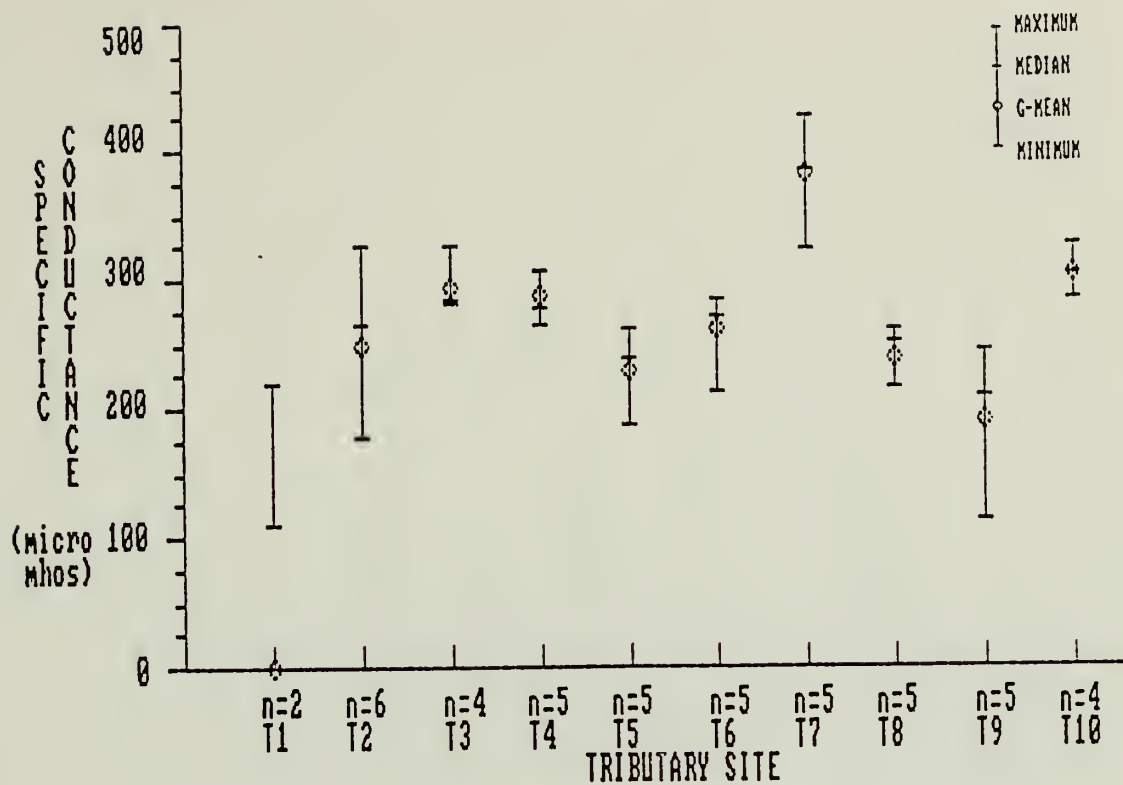


Figure E3: Specific conductance statistics at 20 tributary sampling sites, 1988.

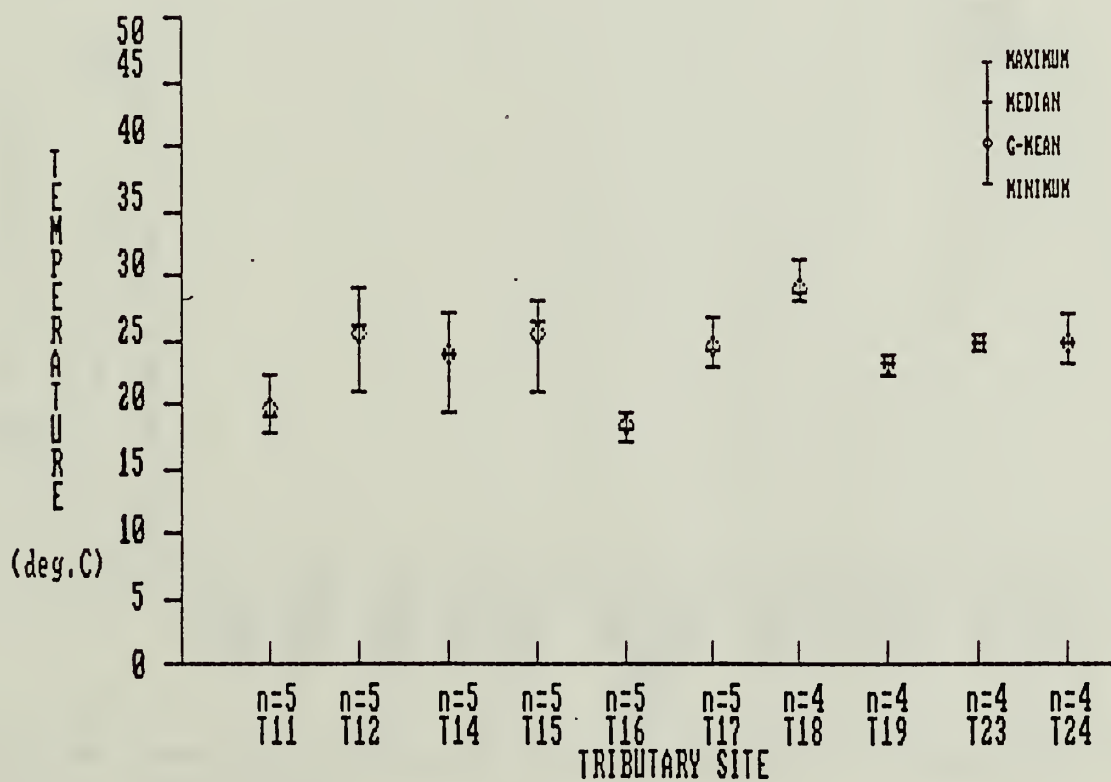
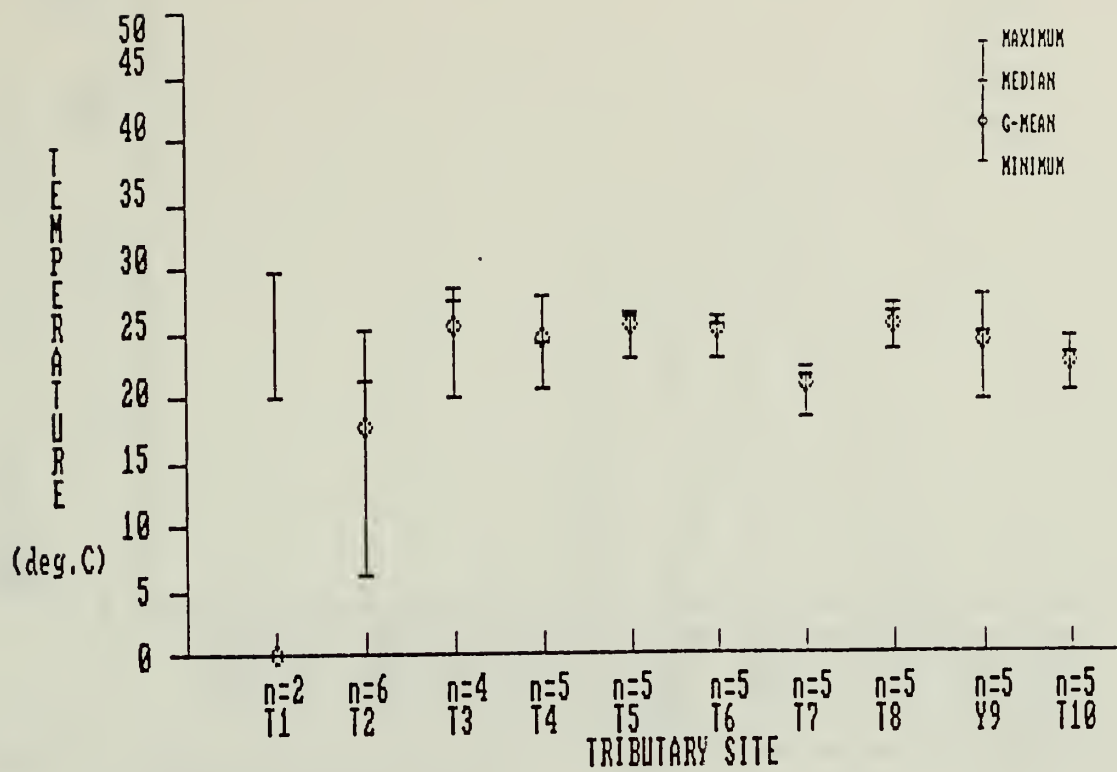


Figure E4: Temperature statistics at 20 tributary sampling sites, 1988.

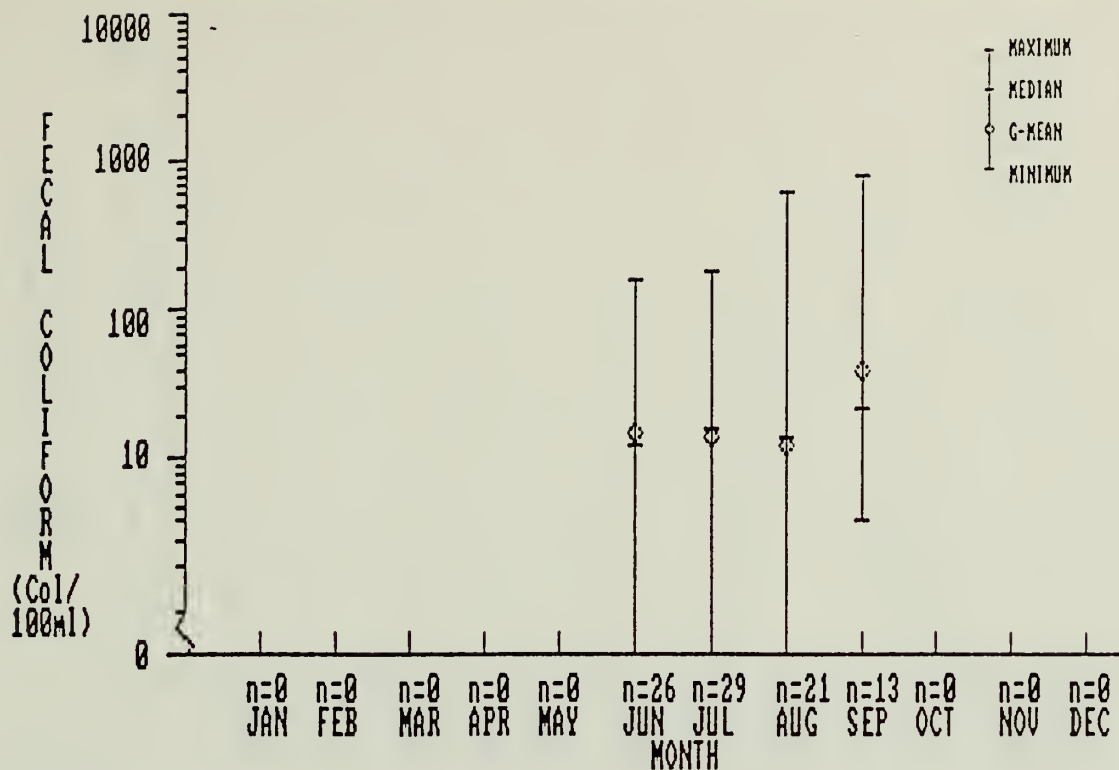


Figure F1: Fecal coliform statistics by month collected at 20 tributary sampling sites, 1988.

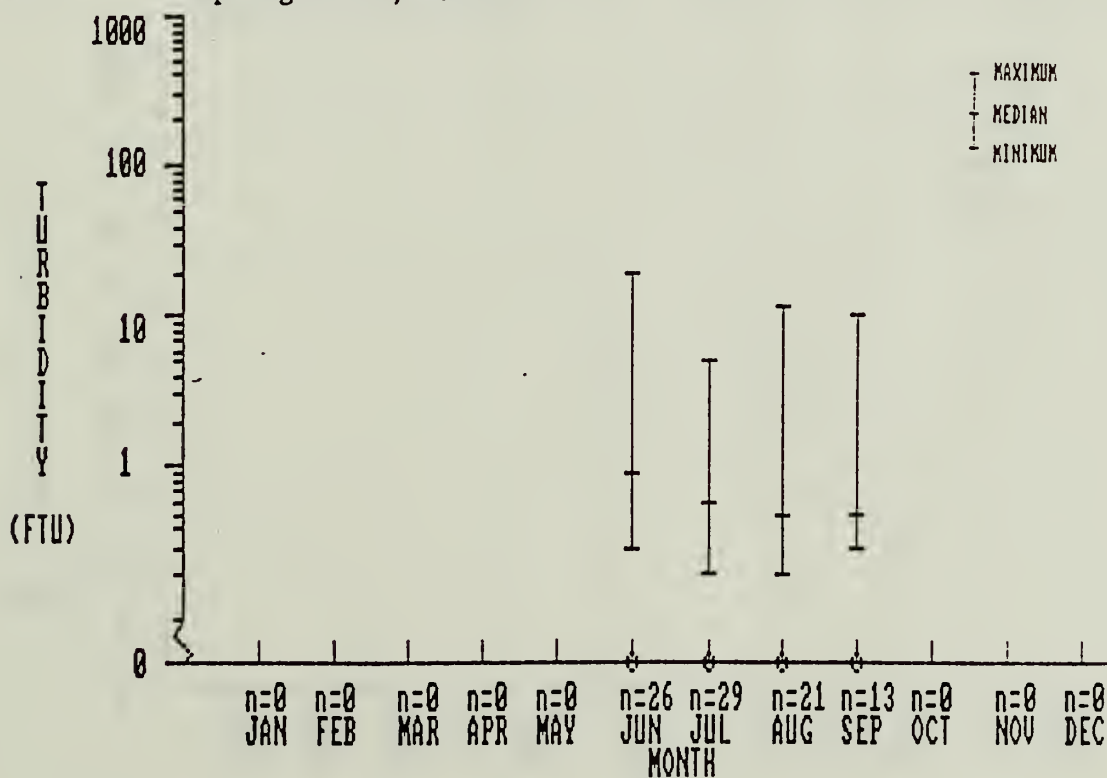


Figure F2: Turbidity statistics by month collected at 20 tributary sampling sites, 1988.

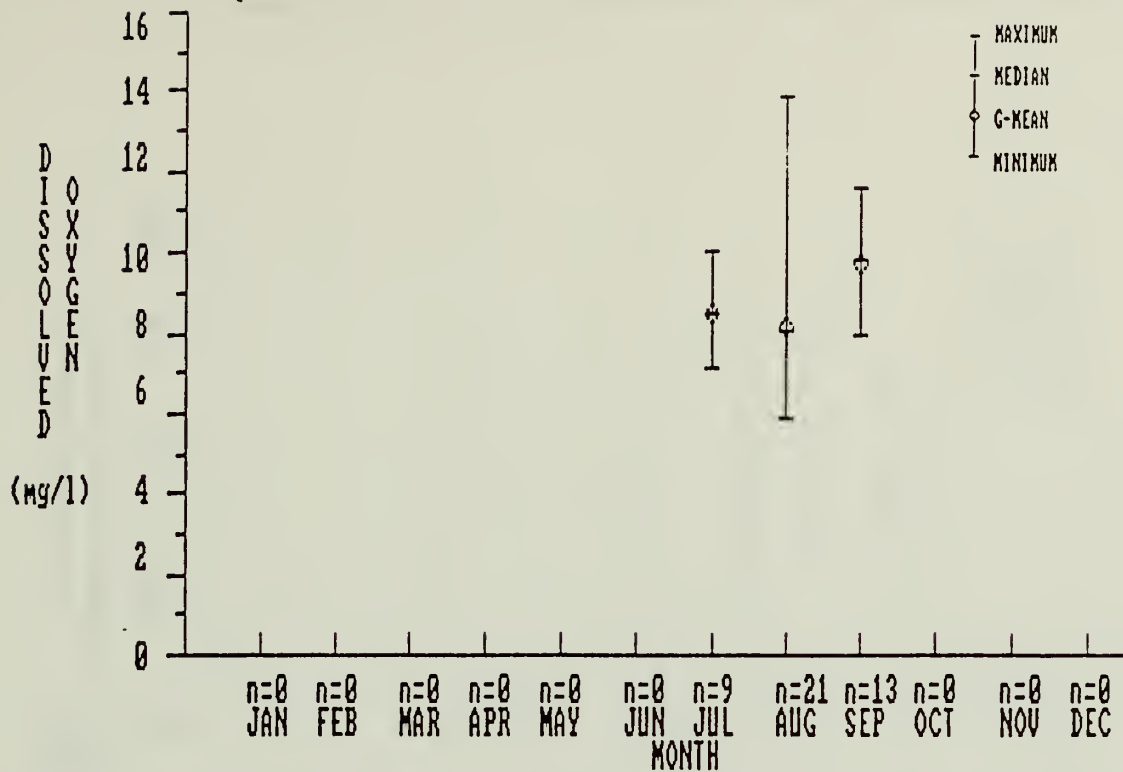


Figure F3: Dissolved oxygen statistics by month collected at 20 tributary sampling sites, 1988.

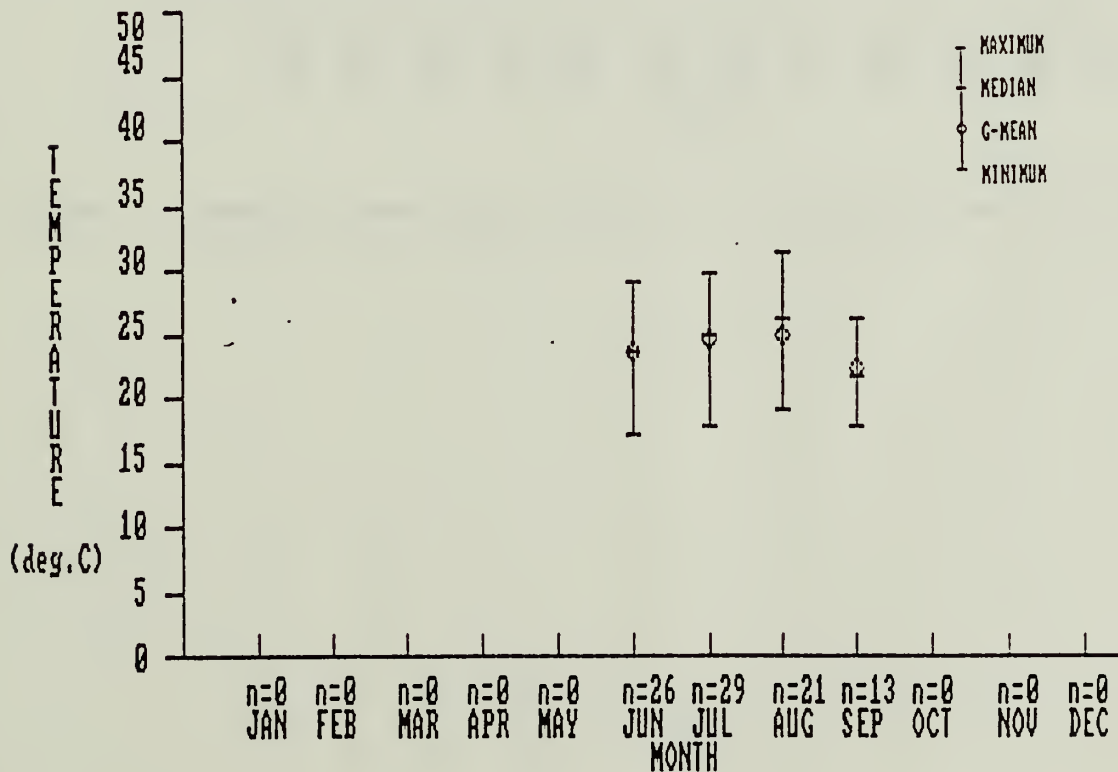


Figure F4: Temperature statistics by month collected at 20 tributary sampling sites, 1988.

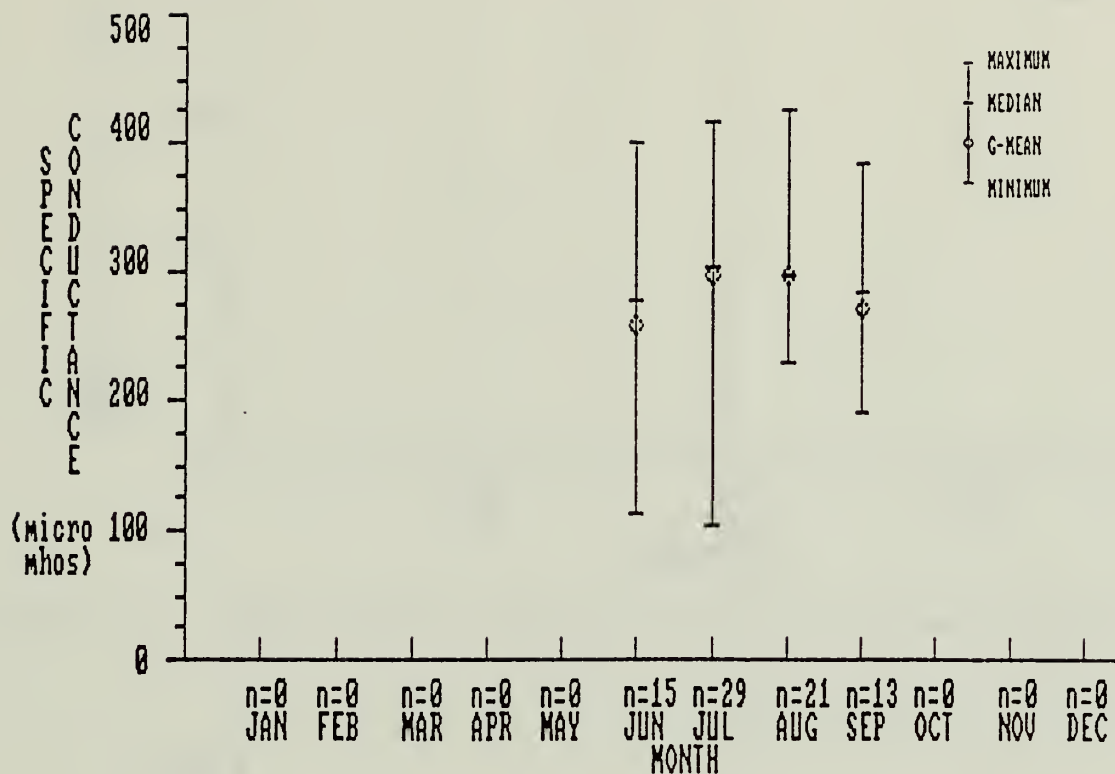


Figure F5: Specific conductance statistics by month collected at 20 tributary sampling sites, 1988.

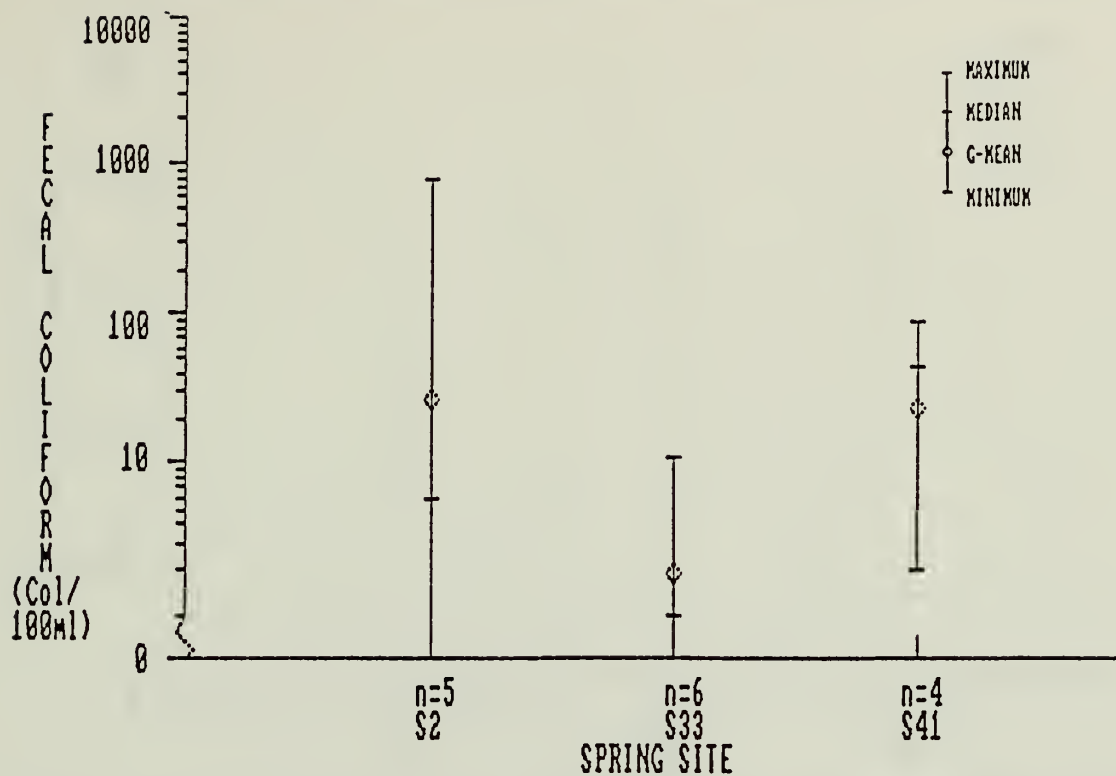


Figure G1: Fecal coliform statistics at three spring sampling sites, 1988.

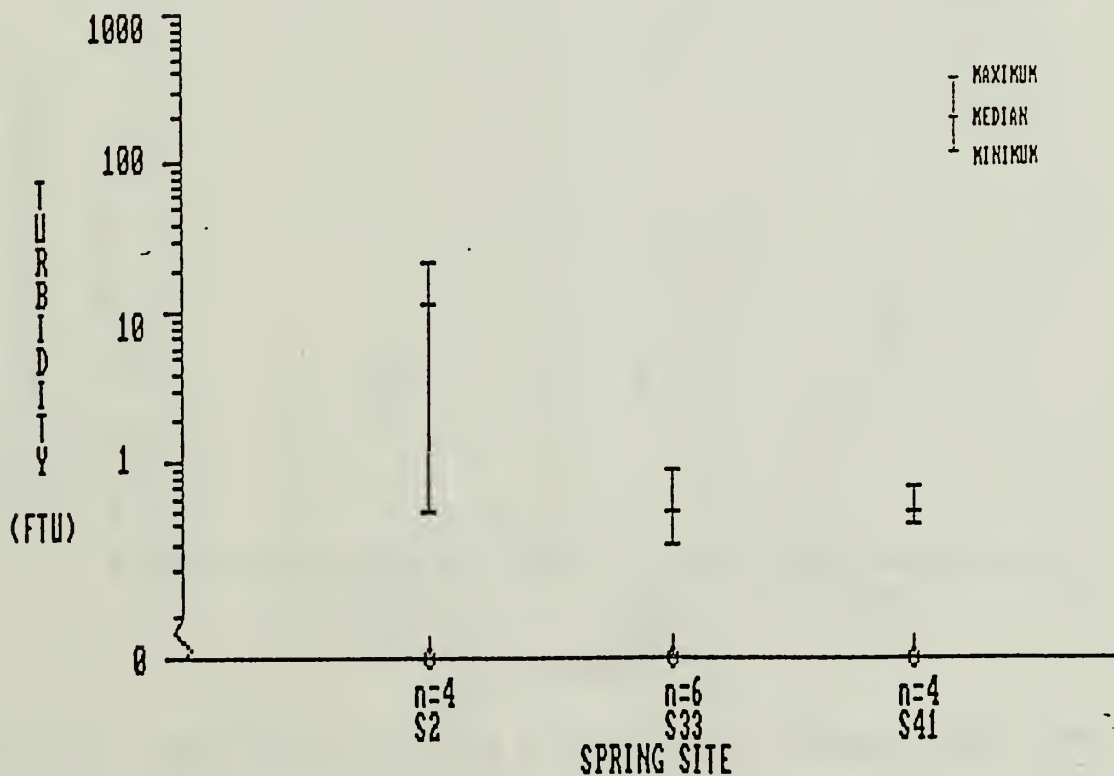


Figure G2: Turbidity statistics at three spring sampling sites, 1988.

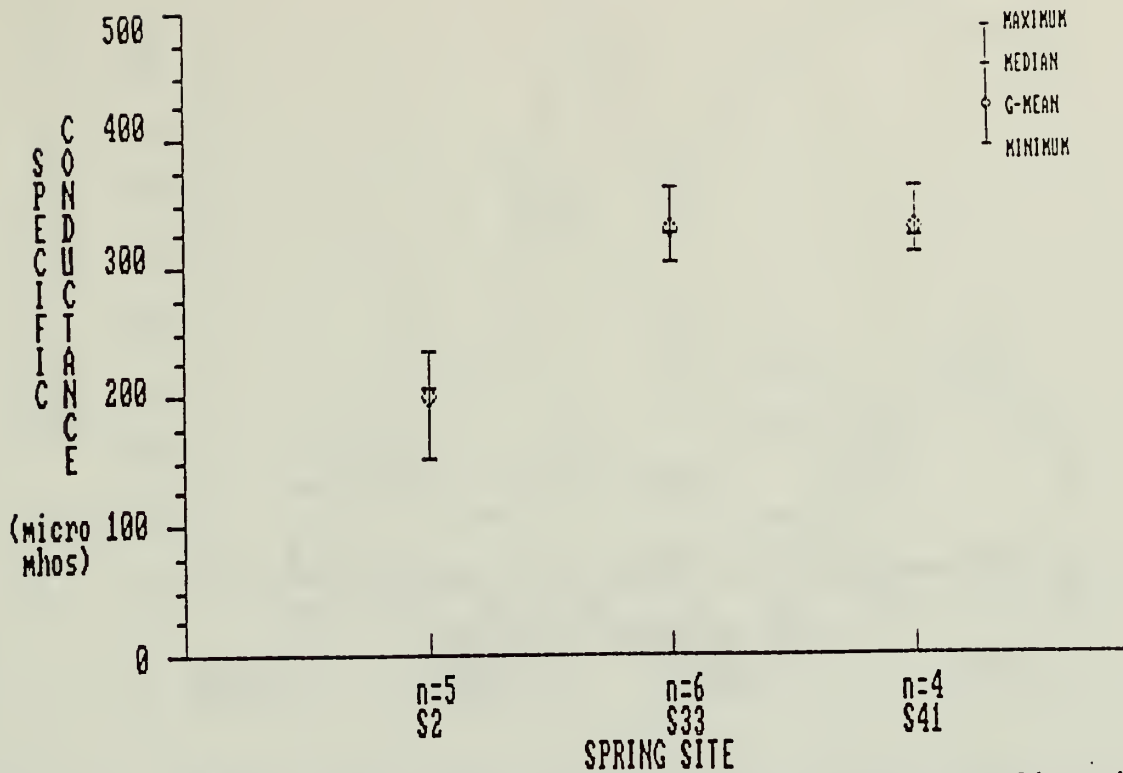


Figure G3: Specific conductance statistics at three spring sampling sites, 1988.

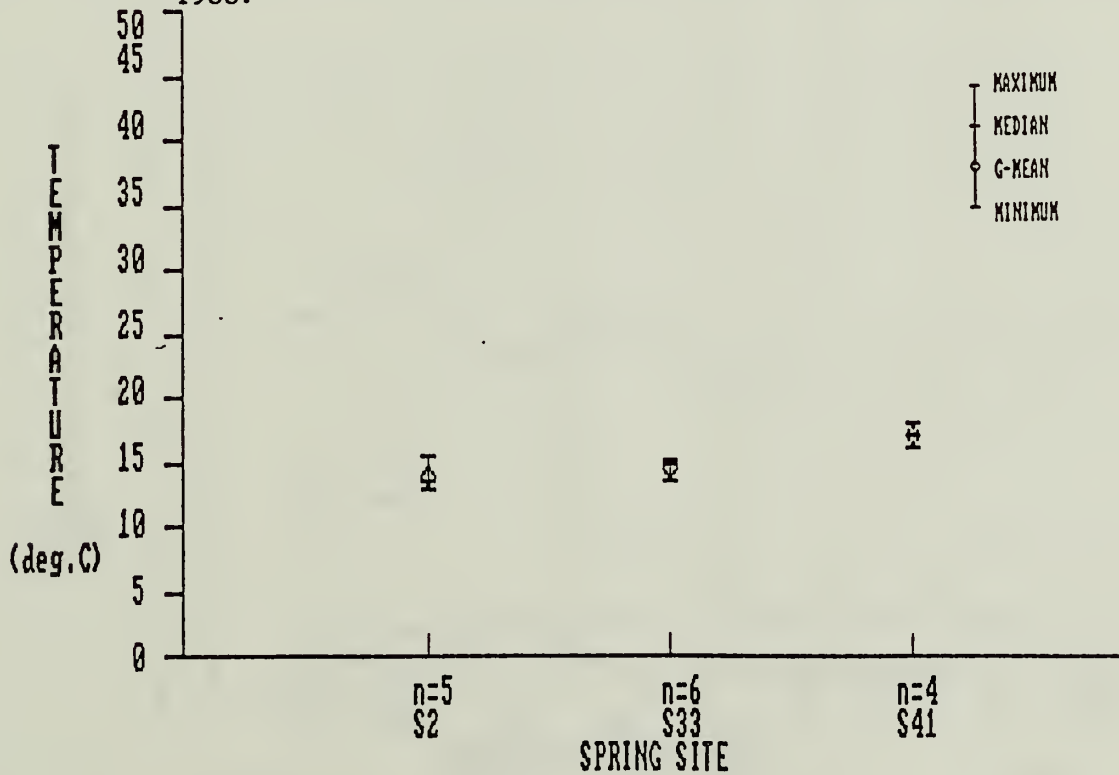


Figure G4: Temperature statistics at three spring sampling sites, 1988.

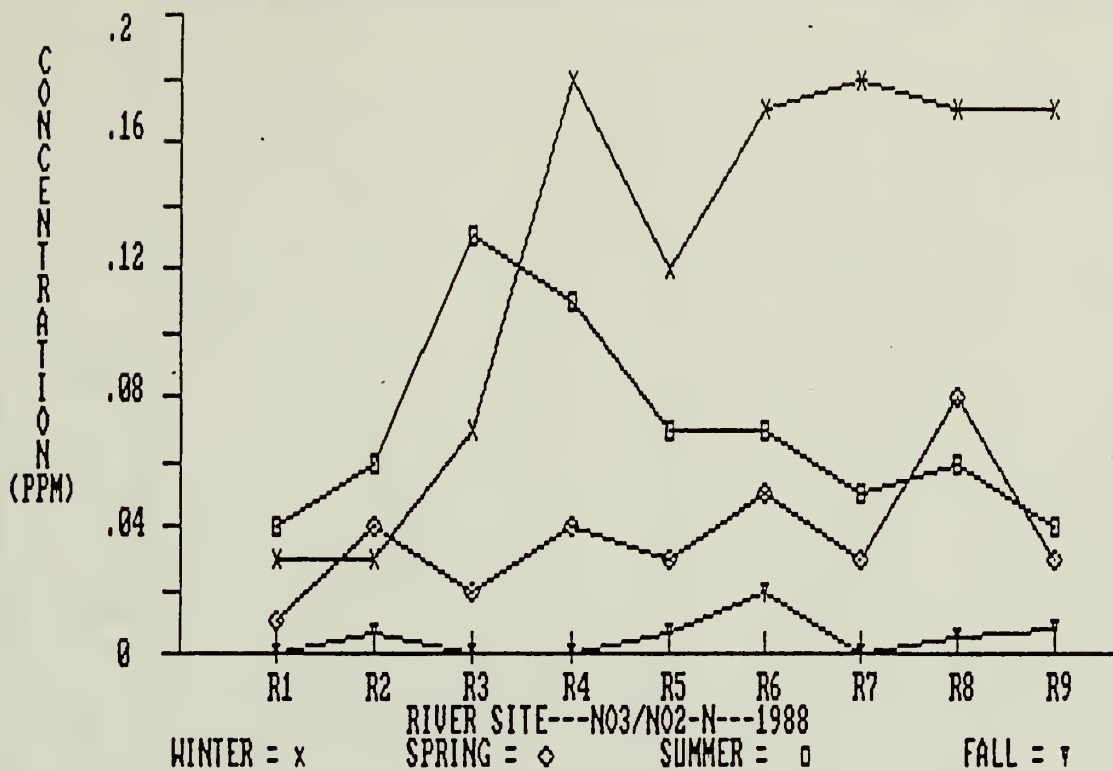


Figure N1: Line graph showing nitrate values by season collected for the river corridor, 1988.

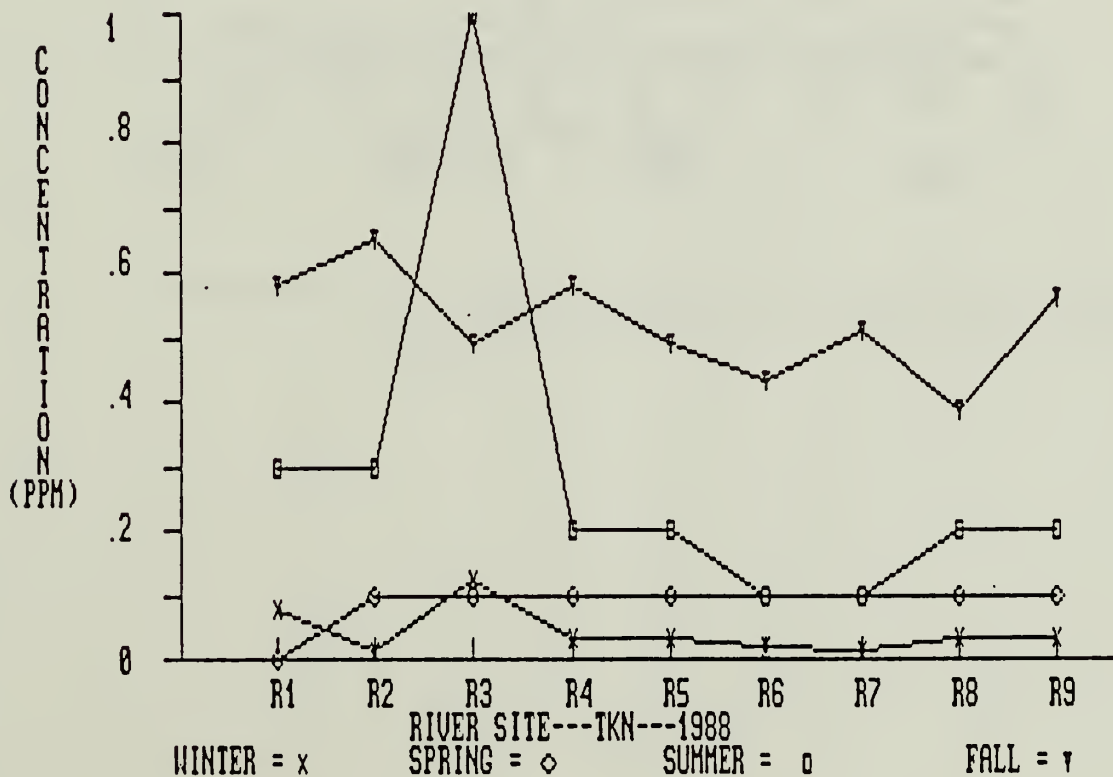


Figure N2: Line graph showing total Kjeldahl nitrogen values by season collected for the river corridor, 1988.

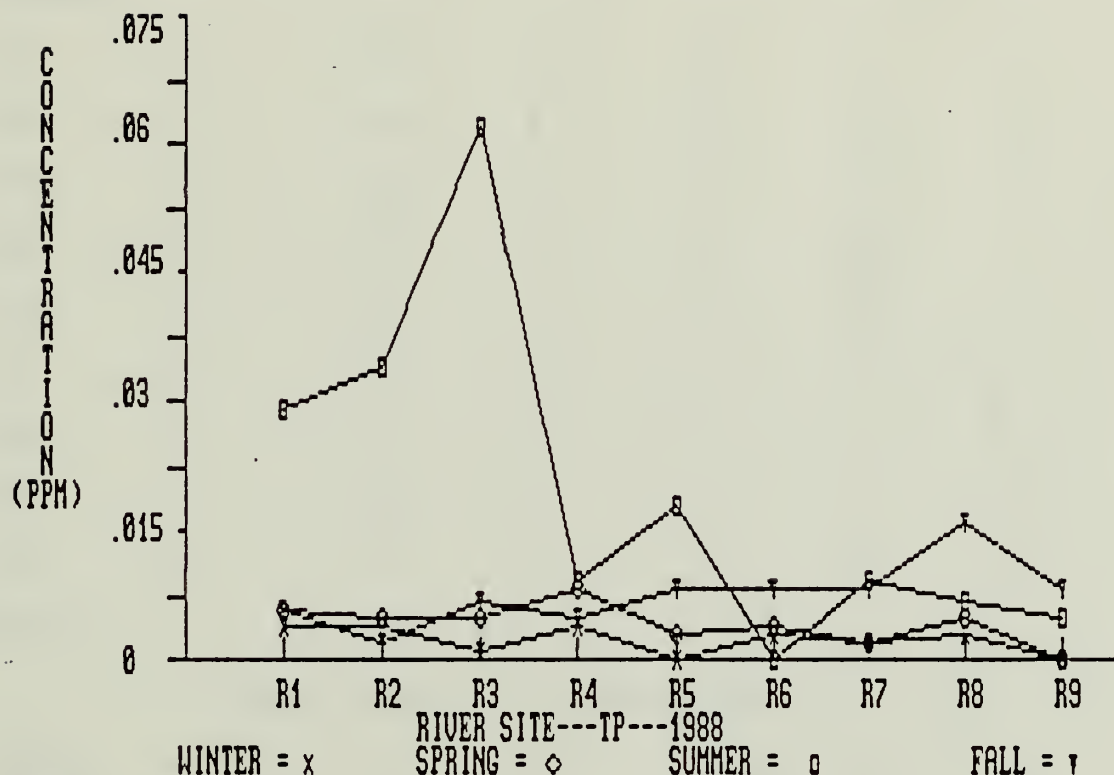


Figure N3: Line graph showing total phosphate values by season collected for the river corridor, 1988.

TABLE 1

RIVER CORRIDOR - FECAL COLIFORM(Col/100ml) - 1988

SITE NUMBER	N-VALUE	MAX	MIN	G-MEAN	MEDIAN	25%	75%
R1	6	567	2	14	11	2	28
R2	10	540	8	44	28	12	148
R3	10	120	0	6	6	2	7
R4	10	72	0	8	10	2	14
R5	10	26	0	2	0	0	3
R6	10	68	0	6	6	1	10
R7	10	56	0	3	3	0	4
R8	10	180	0	4	4	0	7
R9	10	18	0	4	4	0	5

TABLE 2

RIVER CORRIDOR - TURBIDITY (FTU) - 1988

SITE NUMBER	N-VALUE	MAX	MIN	G-MEAN	MEDIAN	25%	75%
R1	3	23.0	1.5	-----	12.0	6.8	17.5
R2	7	21.5	0.5	-----	0.70	0.55	6.9
R3	7	78	0.6	-----	0.80	0.60	3.3
R4	7	17	0.5	-----	1.20	0.60	9.9
R5	7	4.8	0.5	-----	0.70	0.55	1.0
R6	7	10	0.7	-----	2.20	0.70	4.4
R7	7	12.5	0.4	-----	5.30	0.45	8.2
R8	7	13.0	0.4	-----	0.80	0.50	6.3
R9	7	11.0	0.6	-----	0.80	0.65	2.8

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TABLE 3

RIVER CORRIDOR - DISSOLVED OXYGEN (mg/l) - 1988

SITE NUMBER	N-VALUE	MAX	MIN	G-MEAN	MEDIAN	25%	75%
R1	2	13.2	10.7	----	----	----	----
R2	6	13.2	7.6	10.8	10.8	8.9	12.0
R3	6	13.2	8.6	10.8	10.9	9.3	11.5
R4	6	12.8	6.8	10.5	11.4	8.1	12.4
R5	7	13.5	7.4	11.3	13.0	8.7	13.1
R6	7	14.1	6.5	10.9	12.1	7.6	13.1
R7	7	15.4	7.7	11.4	12.0	8.3	13.1
R8	7	14.0	8.6	11.4	12.2	8.8	13.1
R9	7	14.2	8.0	10.9	10.9	8.3	12.7

TABLE 4

RIVER CORRIDOR - TEMPERATURE (deg.C) - 1988

SITE NUMBER	N-VALUE	MAX	MIN	G-MEAN	MEDIAN	25%	75%
R1	6	20.7	5.9	10.3	9.0	6.4	14.0
R2	10	29.0	5.8	13.9	16.0	7.2	20.9
R3	10	30.4	2.5	12.1	14.2	6.4	21.9
R4	10	28.4	6.5	15.8	17.5	8.4	25.1
R5	10	28.9	7.3	16.5	19.3	8.4	26.3
R6	10	28.3	8.0	16.5	18.0	8.9	25.5
R7	10	29.2	7.2	16.5	19.5	8.2	25.8
R8	10	31.1	7.1	16.7	18.7	8.6	26.2
R9	10	29.6	7.5	16.2	16.9	9.3	23.9

TABLE 5

RIVER CORRIDOR - SPECIFIC CONDUCTANCE (umhos) - 1988							
SITE NUMBER	N-VALUE	MAX	MIN	G-MEAN	MEDIAN	25%	75%
R1	6	140	52	83	81	60	103
R2	10	240	56	139	163	90	196
R3	10	278	97	179	185	120	246
R4	10	277	120	199	236	140	226
R5	9	279	130	224	255	199	266
R6	10	295	140	219	242	161	258
R7	10	284	144	223	241	166	254
R8	10	286	145	218	232	167	259
R9	9	294	167	233	228	196	253

TABLE 6

RIVER CORRIDOR (by month)-FECAL COLIFORM (Col/100ml)-1988							
MONTH	N-VALUE	MAX	75%	G-MEAN	50%	25%	MIN
JAN	0	----	----	----	----	----	----
FEB	9	30	11	5	6	0	0
MAR	9	16	0	2	0	0	0
APR	0	----	----	----	----	----	----
MAY	9	18	11	6	8	3	0
JUN	8	68	12	7	8	4	0
JUL	9	567	150	36	72	2	0
AUG	8	26	14	8	10	4	2
SEP	8	220	10	7	5	0	0
OCT	8	180	6	5	3	0	0

TABLE 6(CONT)

RIVER CORRIDOR (by month)-FECAL COLIFORM (Col/100ml)-1988

MONTH	N-VALUE	MAX	75%	G-MEAN	50%	25%	MIN
NOV	9	40	6	4	4	1	0
DEC	9	115	8	7.3	6	3	0

TABLE 7

RIVER CORRIDOR (by month)-TURBIDITY(FTU)-1988

MONTH	N-VALUE	MAX	75%	50%	25%	MIN
JUN	8	17.0	11.0	10.0	0.7	0.7
JUL	9	78.0	17.0	12.0	1.8	1.0
AUG	8	7.8	5.4	5.1	0.6	0.5
SEP	8	2.6	0.8	0.8	0.7	0.6
OCT	8	0.8	0.7	0.6	0.6	0.5
NOV	9	1.5	0.7	0.6	0.5	0.4
DEC	9	13.0	6.1	1.0	0.8	0.7

TABLE 8

RIVER CORRIDOR (by month)-DISSOLVED OXYGEN(mg/l)-1988

MONTH	N-VALUE	MAX	75%	G-MEAN	50%	25%	MIN
JAN	0	----	----	----	----	----	----
FEB	5	13.1	12.7	12.2	12.2	11.5	10.8
MAR	9	13.0	13.0	12.3	12.8	12.0	10.0
AUG	8	10.2	8.6	8.1	8.1	6.8	6.5
SEP	8	9.9	9.0	8.7	8.8	8.0	7.6

TABLE 8(CONT)

RIVER CORRIDOR (by month)-DISSOLVED OXYGEN(mg/l)-1988

MONTH	N-VALUE	MAX	75%	G-MEAN	50%	25%	MIN
OCT	8	15.4	14.0	13.0	13.2	11.0	11.0
NOV	9	11.2	10.9	10.8	10.8	10.7	10.6
DEC	9	14.2	13.2	13.2	13.2	13.1	12.8

TABLE 9

RIVER CORRIDOR (by month)-TEMPERATURE(deg.C)-1988

MONTH	N-VALUE	MAX	75%	G-MEAN	50%	25%	MIN
JAN	0	----	----	----	----	----	----
FEB	9	8.0	7.5	6.9	7.3	6.1	5.8
MAR	9	15.0	15.0	12.9	15.0	11.0	8.0
APR	0	----	----	----	----	----	----
MAY	9	22.0	20.2	19.8	19.5	18.6	18.0
JUN	8	29.6	29.0	27.8	27.9	26.4	25.5
JUL	9	28.5	27.0	25.4	26.6	23.1	20.6
AUG	8	31.3	29.6	29.4	29.1	28.4	28.3
SEP	8	25.5	25.1	23.3	24.1	21.1	18.4
OCT	8	17.1	16.8	15.8	15.9	14.4	14.0
NOV	9	9.9	9.6	9.5	9.6	9.15	8.8
DEC	9	9.0	7.4	7.3	7.2	6.8	6.4

TABLE 10

RIVER CORRIDOR (by month)-SPECIFIC CONDUCTANCE(umhos)-1988

MONTH	N-VALUE	MAX	75%	G-MEAN	50%	25%	MIN
JAN	0	-----	-----	-----	-----	-----	-----
FEB	8	167	154	123	141	86	67
MAR	9	200	142	111	130	77	52
APR	0	-----	-----	-----	-----	-----	-----
MAY	9	192	183	146	181	118	65
JUN	8	290	272	256	267	232	202
JUL	9	259	254	199	233	144	109
AUG	8	263	254	241	253	214	214
SEP	8	234	218	217	223	209	191
OCT	8	295	286	274	282	245	240
NOV	8	255	255	227	250	193	140
DEC	9	246	226	186	220	148	97

TABLE 11

TRIBUTARY SITES-FECAL COLIFORM(Col/100ml)-1988

SITE NUMBER	N-VALUE	MAX	MIN	G-MEAN	MEDIAN	25%	75%
T1	2	350	16	NA	NA	NA	NA
T2	6	550	0	12	9	2	13
T3	4	36	0	6	7	0	10
T4	5	247	2	15	18	3	19
T5	5	56	10	21	16	13	23
T6	5	26	2	7	8	3	8
T7	5	30	12	18	18	13	20
T8	5	74	0	11	16	3	17
T9	5	610	40	154	109	47	351
T10	5	692	8	25	12	8	16
T11	5	58	4	11	8	5	10
T12	5	20	14	17	16	15	18
T13	0	-----	-----	-----	-----	-----	-----
T14	5	776	34	98	64	47	75
T15	5	680	4	18	6	4	19
T16	5	22	4	10	8	6	15
T17	5	180	10	29	30	11	32
T18	4	32	0	6	7	0	8
T19	4	40	2	12	16	2	18
T23	4	26	2	7	8	2	12
T24	4	164	10	40	41	10	54

TABLE 12

TRIBUTARY SITES-TURBIDITY(FTU)-1988

SITE NUMBER	N-VALUE	MAX	MIN	MEDIAN	75%	25%
T1	0	----	----	----	----	----
T2	5	12.0	1.0	1.70	4.95	1.30
T3	4	13.5	1.4	1.70	1.70	1.40
T4	5	10.7	0.3	0.50	1.35	0.30
T5	5	1.0	0.4	0.80	0.85	0.45
T6	5	12.7	0.6	0.90	2.05	0.75
T7	5	0.6	0.3	0.30	0.30	0.30
T8	5	14.0	0.5	0.90	0.90	0.50
T9	5	19.6	1.0	4.60	8.25	1.05
T10	5	17.5	1.0	2.40	2.50	1.50
T11	5	0.5	0.2	0.30	0.35	0.20
T12	5	1.1	0.5	0.50	0.70	0.50
T13	0	----	----	----	----	----
T14	5	6.9	0.5	0.50	0.55	0.50
T15	5	10.2	0.3	0.50	0.55	0.35
T16	5	1.8	0.4	0.50	0.75	0.40
T17	5	1.0	0.4	0.50	0.60	0.40
T18	4	0.9	0.3	0.55	0.60	0.30
T19	4	5.0	0.4	0.90	0.90	0.40
T23	4	0.40	0.2	0.30	0.30	0.20
T24	4	0.4	0.3	0.35	0.40	0.30

TABLE 13

TRIBUTARY SITES-SPECIFIC CONDUCTANCE(umhos) - 1988

SITE NUMBER	N-VALUE	MAX	MIN	G-MEAN	MEDIAN	25%	75%
T1	2	218	111	----	----	----	----
T2	6	325	177	250	263	189	294
T3	4	326	280	293	284	280	284
T4	5	307	264	287	277	274	292
T5	5	262	186	229	239	204	241
T6	5	284	214	260	271	237	274
T7	5	425	322	381	384	352	392
T8	5	262	215	240	252	219	252
T9	5	244	114	189	209	152	215
T10	4	327	284	303	302	284	314
T11	4	329	104	242	318	104	320
T12	4	304	216	257	258	216	266
T13	0	----	----	----	----	----	----
T14	4	366	287	324	324	287	322
T15	4	292	243	272	278	243	280
T16	4	339	294	312	308	294	319
T17	4	405	377	388	385	377	387
T18	3	292	240	----	----	----	----
T19	3	396	350	----	----	----	----
T23	3	415	380	----	----	----	----
T24	3	360	350	----	----	----	----

TABLE 14

TRIBUTARY SITES-TEMPERATURE(deg.C)-1988

SITE NUMBER	N-VALUE	MAX	MIN	G-MEAN	MEDIAN	75%	25%
T1	2	29.6	20	----	----	----	----
T2	6	25.2	6.2	17.8	21.4	23.9	12.4
T3	4	28.5	20.0	25.6	27.5	28.2	20.0
T4	5	27.8	20.5	24.6	24.3	25.5	22.4
T5	5	26.4	22.8	25.5	26.2	26.3	24.4
T6	5	26.0	22.9	25.1	25.6	25.7	24.2
T7	5	22.3	18.3	20.9	21.6	21.6	19.6
T8	5	27.0	23.5	25.6	26.5	26.6	24.0
T9	5	27.9	19.7	24.1	24.8	24.9	21.8
T10	5	24.5	20.4	22.6	23.2	23.7	20.7
T11	5	22.2	17.8	19.6	18.9	19.8	18.3
T12	5	29.0	21.0	25.6	26.1	27	22.9
T13	0	----	----	----	----	----	----
T14	5	27.0	19.4	24.0	23.9	25.3	21.5
T15	5	28.0	21.0	25.4	26.5	26.5	23.3
T16	5	19.3	17.2	18.31	18.2	18.8	17.5
T17	5	26.7	22.9	24.7	24.2	24.9	23.6
T18	4	31.2	28.0	29.2	28.8	28.8	28.0
T19	4	24.0	22.3	23.1	23.10	23.5	22.3
T23	4	25.5	24.1	24.8	24.9	25	24.1
T24	4	27	23.1	24.9	24.8	24.98	23.1

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TABLE 15

TRIBUTARIES (by month)- FECAL COLIFORM(Col/100ml)-1988

MONTH	N-VALUE	MAX	75%	G-MEAN	50%	25%	MIN
JUN	26	164	34	15	13	7	0
JUL	29	180	61	14	16	7	0
AUG	21	610	19	13	14	6	0
SEP	13	776	312	40	22	8	4

TABLE 16

TRIBUTARIES (by month)-TURBIDITY(FTU)-1988

MONTH	N-VALUE	MAX	75%	50%	25%	MIN
JUN	26	19.6	5.9	0.9	0.5	0.3
JUL	29	5.0	1.0	0.6	0.4	0.2
AUG	21	11.9	1.2	0.5	0.3	0.2
SEP	13	10.2	1.3	0.5	0.4	0.3

TABLE 17

TRIBUTARIES (by month)-TEMPERATURE(deg.C)-1988

MONTH	N-VALUE	MAX	75%	G-MEAN	50%	25%	MIN
JUN	26	29.0	26.5	23.6	23.4	21.6	17.2
JUL	29	29.6	26.2	24.4	24.7	23.8	17.8
AUG	21	31.2	27.0	24.8	26.0	23.2	18.9
SEP	13	26.0	24.6	22.2	21.6	19.9	17.8

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TABLE 18

TRIBUTARIES (by month)-DISSOLVED OXYGEN(mg/l)-1988

MONTH	N-VALUE	MAX	75%	G-MEAN	50%	25%	MIN
JUL	9	10.0	8.8	8.5	8.5	8.0	7.1
AUG	21	13.8	8.6	8.2	8.1	7.6	5.9
SEP	13	11.6	10.4	9.7	9.8	9.0	8.0

TABLE 19

TRIBUTARIES (by month)-SPECIFIC CONDUCTANCE(umhos)-1988

MONTH	N-VALUE	MAX	75%	G-MEAN	50%	25%	MIN
JUN	15	400	321	259	277	215	114
JUL	29	415	366	298	304	263	104
AUG	21	425	324	298	296	256	228
SEP	13	383	289	271	284	222	190

TABLE 20

RIVER CORRIDOR (by year) - FECAL COLIFORM(Col/100/ml) - 1985/88

YEAR	N-VALUE	MAX	MIN	G-MEAN	50%	25%	75%
85	75	338	0	3	2	0	4
86	52	128	0	3	2	0	6
87	71	668	0	4	2	0	10
88	86	567	0	6	5	1	14

TABLE 21

RIVER CORRIDOR (by year) - SPECIFIC CONDUCTANCE(umhos) - 1985/88

YEAR	N-VALUE	MAX	MIN	G-MEAN	50%	25%	75%
85	76	280	64	171	192	153	223
86	52	348	83	197	220	154	242
87	71	281	44	158	196	148	203
88	84	295	52	188	213	145	233

TABLE 22

RIVER CORRIDOR (by year) - TEMPERATURE(deg.C) - 1985/88

YEAR	N-VALUE	MAX	MIN	G-MEAN	50%	25%	75%
85	76	31.5	2.5	18.3	23.0	16.5	26.0
86	52	31.5	6.0	20.4	24.8	20.5	29.5
87	71	32.0	4.0	16.9	20.5	11.0	27.3
88	86	31.1	5.8	15.4	17.0	9.0	25.5

TABLE 23

RIVER CORRIDOR (by year) - DISSOLVED OXYGEN(mg/l) - 1985/88

YEAR	N-VALUE	MAX	MIN	G-MEAN	50%	25%	75%
85	39	14.0	6.0	10.0	10.0	9.0	11.0
86	17	10.0	8.0	9.0	9.0	8.5	9.0
87	42	14.0	5.9	8.9	8.2	7.3	11.0
88	56	15.4	6.5	11.0	11.1	9.9	13.0

TABLE 24

R1 (by year) - FECAL COLIFORM(Col/100ml) - 1985/88

YEAR	N-VALUE	MAX	MIN	G-MEAN	MEDIAN	25%	75%
85	12	338	0	4	2	0	4
86	6	14	0	3	4	0	7
87	8	16	0	2	2	0	2
88	6	567	2	14	11	2	28

R2 - FECAL COLIFORM

YEAR	N-VALUE	MAX	MIN	G-MEAN	MEDIAN	25%	75%
85	10	200	0	6	2	1	12
86	6	128	0	9	13	0	18
87	9	200	0	16	8	4	62
88	10	540	0	44	28	12	148

R3 - FECAL COLIFORM

YEAR	N-VALUE	MAX	MIN	G-MEAN	MEDIAN	25%	75%
85	9	174	0	3	2	0	3
86	6	10	0	2	2	0	5
87	8	64	0	5	4	0	4
88	10	120	0	6	6	2	7

R4 - FECAL COLIFORM

YEAR	N-VALUE	MAX	MIN	G-MEAN	MEDIAN	25%	75%
85	8	15	0	3	3	0	4
86	6	8	0	4	4	1	6
87	8	172	0	9	7	0	12
88	10	72	0	8	10	2	14

TABLE 24(CONT)

R5 - FECAL COLIFORM

YEAR	N-VALUE	MAX	MIN	G-MEAN	MEDIAN	25%	75%
85	9	30	0	2	2	0	3
86	6	2	0	1	0	0	0
87	7	78	0	4	2	0	8
88	10	26	0	2	0	0	3

R6 - FECAL COLIFORM

YEAR	N-VALUE	MAX	MIN	G-MEAN	MEDIAN	25%	75%
85	9	10	0	2	0	0	3
86	6	8	2	4	4	2	5
87	8	564	0	3	0	0	0
88	10	68	0	6	6	1	10

R7 - FECAL COLIFORM

YEAR	N-VALUE	MAX	MIN	G-MEAN	MEDIAN	25%	75%
85	8	145	0	3	0	0	2
86	6	6	0	2	1	0	2
87	8	356	0	3	0	0	2
88	10	56	0	3	3	0	4

TABLE 24(CONT)

R8 - FECAL COLIFORM

YEAR	N-VALUE	MAX	MIN	G-MEAN	MEDIAN	25%	75%
85	8	145	0	3	2	0	4
86	6	22	0	2	1	0	4
87	9	668	0	4	2	0	6
88	10	180	0	4	4	0	7

R9 - FECAL COLIFORM

YEAR	N-VALUE	MAX	MIN	G-MEAN	MEDIAN	25%	75%
85	5	4	0	2	2	1	3
86	4	6	0	2	2	0	4
87	6	6	0	2	0	0	1
88	10	18	0	4	4	0	5

TABLE 25

SPRING SITES - FECAL COLIFORM (Col/100ml) - 1988

SITE NUMBER	N-VALUE	MAX	75%	GEO MEAN	50%	25%	MIN
S2	5	780	356	26.5	6	2	0
S33	6	11	2	1.9	1	0	0
S41	4	92	66	23.7	46	2	2

SPRING SITES - SPECIFIC CONDUCTANCE (umhos) - 1988

S2	5	236	207	199	206	177	152
S33	6	361	347	328	326	303	302
S41	4	360	334	329	324	311	311

SPRING SITES - TURBIDITY (FTU) - 1988

S2	4	22.0	22.0	11.6	0.5	0.5
S33	6	0.9	0.7	0.5	0.3	0.3
S41	4	0.7	0.6	0.5	0.4	0.4

SPRING SITES - TEMPERATURE (deg.C) - 1988

S2	5	15.5	13.8	13.9	13.7	13.2	13.0
S33	6	15.3	15.0	14.6	14.8	13.9	13.6
S41	4	18.0	17.0	17.0	17.0	16.2	16.2

TABLE 26

RIVER CORRIDOR - NO3/NO2 - 1988

<u>Site #</u>	<u>Winter</u> 2/3/88	<u>Spring</u> 7/5/88	<u>Summer</u> 7/20/88	<u>Fall</u> 11/18/88
R1	0.03	0.01	0.04	0.00
R2	0.03	0.04	0.13	0.007
R3	0.07	0.02	0.13	0.000
R4	0.18	0.04	0.11	0.000
R5	0.12	0.03	0.07	0.007
R6	0.17	0.05	0.07	0.020
R7	0.18	0.03	0.05	0.000
R8	0.17	0.08	0.06	0.005
R9	0.17	0.03	0.04	0.008

RIVER CORRIDOR - TOTAL KJELDAHL NITROGEN - 1988

<u>RIVER</u> <u>STATION</u>	<u>WINTER</u>	<u>SPRING</u>	<u>SUMMER</u>	<u>FALL</u>
R1	0.08	0.00	0.30	0.58
R2	0.01	0.10	0.30	0.65
R3	0.12	0.10	1.00	0.49
R4	0.03	0.10	0.20	0.58
R5	0.03	0.10	0.20	0.49
R6	0.02	0.10	0.10	0.43
R7	0.01	0.10	0.10	0.51
R8	0.03	0.10	0.20	0.39
R9	0.03	0.10	0.20	0.56

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RIVER CORRIDOR - TOTAL PHOSPHATE - 1988

RIVER STATION	WINTER	SPRING	SUMMER	FALL
R1	0.004	0.006	0.029	0.006
R2	0.004	0.005	0.034	0.002
R3	0.001	0.005	0.062	0.007
R4	0.004	0.008	0.009	0.005
R5	0.000	0.003	0.018	0.008
R6	0.003	0.004	0.000	0.008
R7	0.002	0.002	0.009	0.008
R8	0.003	0.005	0.007	0.016
R9	0.000	0.000	0.005	0.008

RIVER CORRIDOR - AMMONIA - 1988

RIVER STATION	WINTER	SPRING	SUMMER	FALL
R1	----	----	----	0.00
R2	----	----	----	0.00
R3	----	----	----	0.00
R4	----	----	----	0.00
R5	----	----	----	0.02
R6	----	----	----	0.00
R7	----	----	----	0.05
R8	----	----	----	0.00
R9	----	----	----	0.03

TABLE 27

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METALS AND CATION DATA
BUFFALO NATIONAL RIVER
FEBRUARY 3, 1988

SAMPLE	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	Fe mg/l	Mn mg/l	Ni ug/l	As ug/l	Cd ug/l	Cu ug/l	Co ug/l	Zn ug/l
R-1	9.9	1.07	1.0	0.5	0.07	0.00	0	0	0	2	0	5
R-2	15	1.30	1.2	0.6	0.24	0.01	0	0	1	2	0	4
R-3	23	1.88	2.8	0.6	0.07	0.00	1	0	0	5	0	24
R-4	28	1.93	1.4	0.6	0.06	0.00	1	0	0	2	1	5
R-5	32	2.46	1.5	0.7	0.07	0.00	2	1	0	2	1	3
R-6	34	2.12	1.5	0.6	0.08	0.00	1	1	0	2	1	3
R-7	34	2.76	1.6	0.7	0.16	0.00	1	1	0	2	1	5
R-8	35	2.69	1.5	0.7	0.05	0.00	2	1	0	2	0	3
R-9	36	4.14	1.5	0.7	0.12	0.00	1	1	0	4	1	3

*** Pb, Ag and Cr values are 0 ug/l at all stations.

METALS AND CATION DATA
BUFFALO NATIONAL RIVER
MAY 3, 1988

SAMPLE	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	Fe mg/l	Mn mg/l	Ni mg/l	As mg/l	Pb mg/l	Cu mg/l	Co mg/l	Zn mg/l
R-1	28.0	1.30	1.35	0.74	.14	.00	7	0	2	9	0	3.00
R-2	18.7	1.48	1.08	0.75	.03	.00	1	1	0	0	0	.01
R-3	29.5	2.24	1.17	0.74	.03	.01	1	1	0	1	0	.01
R-4	34.5	2.27	1.34	0.79	.03	.01	2	1	0	1	0	.00
R-5	36.7	3.22	1.32	0.76	.05	.00	1	1	0	1	0	.00
R-6	37.3	2.52	1.30	0.73	.04	.00	1	3	0	1	0	.01
R-7	38.5	3.12	1.39	0.75	.01	.00	1	2	0	2	0	.00
R-8	38.9	3.18	1.42	0.81	.03	.01	1	2	0	0	0	.00
R-9	40.4	4.71	1.50	0.85	.01	.00	2	4	1	5	0	.01

*** Ag, Cd and Cr values are 0 ug/l at all stations.

APPENDIX I
RIVER CORRIDOR
ORIGINAL DATA; 1988

Negative values indicates the parameter was not analyzed.
Missing staff gage readings indicated by -99.99.

Buffalo National River
1988 Water Quality Data

RIVER LOCATIONS

SITE #	DATE	WATER TEMP. (deg.C)	SPECIFIC CONDUCTIVITY (umhos)	pH	DISSOLVED OXYGEN (mg/l)	TURBIDITY (FTU)	FECAL COLIFORM (col./100ml)	NO3/NO2-N (mg/l)	TKN (mg/l)	TP (mg/l)	NH4-N (mg/l)	STAFF GAUGE (FT)
** BOXLEY												
R1	02/03/88	5.9	29.0	7.88	-1.0	-10.0	2	0.030	0.080	0.004	-1.000	2.00
R1	03/30/88	8.0	18.0	8.21	10.0	-1.0	16	0.010	0.000	0.006	-1.000	3.90
R1	05/03/88	18.0	51.0	8.60	-1.0	-1.0	2	0.010	0.000	0.006	-1.000	1.86
R1	07/20/88	20.7	100.0	7.02	-1.0	23.0	567	0.040	0.300	0.029	-1.000	-99.99
R1	11/18/88	9.9	110.0	7.72	10.7	1.5	5	0.000	0.580	0.006	0.000	3.05
R1	12/23/88	6.9	61.0	-1.00	13.2	12.0	40	-1.000	-1.000	-1.000	-1.000	3.55
** PONCA												
R2	02/03/88	5.8	48.0	7.71	-1.0	-1.0	16	0.030	0.010	0.004	-1.000	2.00
R2	03/30/88	8.0	22.0	8.20	13.0	-1.0	12	0.040	0.100	0.005	-1.000	3.90
R2	05/03/88	18.0	79.0	8.45	-1.0	-1.0	8	0.040	0.100	0.005	-1.000	1.86
R2	06/21/88	29.0	210.0	7.69	-1.0	0.7	12	-1.000	-1.000	-1.000	-1.000	1.32
R2	07/20/88	20.6	125.0	7.28	-1.0	21.5	540	0.060	0.300	0.034	-1.000	3.65
R2	08/15/88	29.0	222.0	7.74	10.2	0.5	14	-1.000	-1.000	-1.000	-1.000	1.32
R2	09/11/88	21.1	183.0	7.41	7.6	0.7	220	-1.000	-1.000	-1.000	-1.000	1.36
R2	10/23/88	14.0	218.0	7.30	11.0	0.6	180	-1.000	-1.000	-1.000	-1.000	1.42
R2	11/18/88	9.6	162.0	7.70	10.6	0.7	40	0.007	0.650	0.002	0.000	1.81
R2	12/23/88	6.4	80.0	-1.00	13.2	13.0	115	-1.000	-1.000	-1.000	-1.000	2.50
** PRUITT												
R3	02/03/88	6.2	75.0	7.82	-1.0	-1.0	22	0.070	0.120	0.001	-1.000	2.00
R3	03/28/88	14.0	75.0	8.41	12.0	-1.0	0	0.020	0.100	0.005	-1.000	1.50
R3	05/03/88	20.0	132.0	8.19	-1.0	-1.0	4	0.020	0.100	0.005	-1.000	2.20
R3	06/22/88	25.5	233.0	7.56	-1.0	0.9	0	-1.000	-1.000	-1.000	-1.000	0.50
R3	07/20/88	25.5	155.0	7.47	-1.0	78.0	120	0.130	1.000	0.062	1.000	1.70
R3	08/15/88	30.4	225.0	7.67	10.0	0.6	6	-1.000	-1.000	-1.000	-1.000	0.30
R3	09/10/88	23.7	214.0	7.65	8.6	0.8	6	-1.000	-1.000	-1.000	-1.000	0.40
R3	10/23/88	14.4	224.0	7.41	11.0	0.6	4	-1.000	-1.000	-1.000	-1.000	-0.50
R3	11/18/88	9.0	215.0	7.51	10.7	0.7	6	0.000	0.490	0.007	0.000	0.50
R3	12/23/88	6.6	142.0	-1.00	13.2	5.8	8	-1.000	-1.000	-1.000	-1.000	0.80
** HASTY												
R4	02/03/88	6.5	93.0	7.75	-1.0	-1.0	30	0.180	0.030	0.004	-1.000	2.00
R4	03/28/88	15.0	100.0	8.41	12.0	-1.0	0	0.040	0.100	0.008	-1.000	1.50
R4	05/03/88	19.5	149.0	8.09	-1.0	-1.0	14	0.040	0.100	0.008	-1.000	2.20
R4	06/22/88	26.4	255.0	7.62	-1.0	17.0	12	-1.000	-1.000	-1.000	-1.000	0.50
R4	07/20/88	27.0	230.0	7.51	-1.0	12.0	72	0.110	0.200	0.009	-1.000	1.70
R4	08/16/88	28.4	232.0	7.56	6.8	7.8	14	-1.000	-1.000	-1.000	-1.000	0.30
R4	09/10/88	23.7	215.0	8.00	9.3	1.2	4	-1.000	-1.000	-1.000	-1.000	0.40
R4	10/22/88	15.4	258.0	7.87	12.8	0.7	2	-1.000	-1.000	-1.000	-1.000	-0.50
R4	11/18/88	9.3	222.0	7.45	10.7	0.5	2	0.000	0.580	0.005	0.000	0.50
R4	12/23/88	7.5	164.0	-1.00	12.8	1.0	8	-1.000	-1.000	-1.000	-1.000	0.80

Buffalo National River
1988 Water Quality Data

RIVER LOCATIONS

SITE #	DATE	WATER TEMP. (deg.C)	SPECIFIC CONDUCTIVITY (umhos)	pH	DISSOLVED OXYGEN (mg/l)	TURBIDITY (FTU)	FECAL COLIFORM (col./100ml)	NO3/NO2-N (mg/l)	TKN (mg/l)	TP (mg/l)	NH4-N (mg/l)	STAFF GAUGE (FT)
## WOOLUM												
R5	02/03/88	7.3	110.0	7.85	13.1	-1.0	0	0.120	0.030	0.000	-1.000	2.50
R5	03/28/88	15.0	110.0	8.31	13.0	-1.0	0	0.030	0.100	0.003	-1.000	2.00
R5	05/03/88	21.8	171.0	7.89	-1.0	-1.0	0	0.030	0.100	0.003	-1.000	2.50
R5	06/22/88	27.4	278.0	7.63	-1.0	0.7	4	-1.000	-1.000	-1.000	-1.000	0.80
R5	07/20/88	27.8	265.0	7.73	-1.0	1.3	0	0.070	0.200	0.018	-1.000	2.40
R5	08/16/88	28.9	260.0	7.66	7.4	4.8	26	-1.000	-1.000	-1.000	-1.000	0.60
R5	09/10/88	25.1	218.0	8.11	9.9	0.6	0	-1.000	-1.000	-1.000	-1.000	0.70
R5	10/22/88	16.8	263.0	7.91	13.5	0.6	12	-1.000	-1.000	-1.000	-1.000	0.90
R5	11/18/88	9.5	224.0	7.15	10.8	0.5	2	0.007	0.490	0.008	0.020	0.80
R5	12/23/88	7.3	185.0	-1.00	13.1	0.7	0	-1.000	-1.000	-1.000	-1.000	1.20
## GILBERT												
R6	02/03/88	8.0	118.0	7.80	12.1	-1.0	6	0.170	0.020	0.003	-1.000	2.50
R6	03/28/88	15.0	120.0	8.21	13.0	-1.0	0	0.050	0.100	0.004	-1.000	2.00
R6	05/03/88	19.5	170.0	8.45	-1.0	-1.0	16	0.050	0.100	0.004	-1.000	2.50
R6	06/22/88	27.3	265.0	7.74	-1.0	10.0	68	-1.000	-1.000	-1.000	-1.000	0.80
R6	07/20/88	26.6	258.0	7.90	-1.0	2.2	0	0.070	0.100	0.000	-1.000	2.40
R6	08/16/88	28.3	268.0	7.52	6.5	6.2	4	-1.000	-1.000	-1.000	-1.000	0.60
R6	09/10/88	24.4	227.0	7.00	8.7	2.6	10	-1.000	-1.000	-1.000	-1.000	0.70
R6	10/22/88	16.4	278.0	7.77	14.1	0.7	2	-1.000	-1.000	-1.000	-1.000	0.90
R6	11/18/88	9.8	225.0	7.53	10.8	0.7	10	0.020	0.430	0.008	0.000	0.80
R6	12/23/88	8.0	187.0	-1.00	13.1	1.0	6	-1.000	-1.000	-1.000	-1.000	1.20
## HWY 14												
R7	02/03/88	7.5	122.0	8.02	13.1	-1.0	0	0.180	0.010	0.002	-1.000	5.00
R7	03/28/88	15.0	124.0	8.25	12.0	-1.0	0	0.030	0.100	0.002	-1.000	3.00
R7	05/03/88	22.0	182.0	8.49	-1.0	-1.0	4	0.030	0.100	0.002	-1.000	4.10
R7	06/22/88	28.4	289.0	7.81	-1.0	10.0	4	-1.000	-1.000	-1.000	-1.000	0.80
R7	07/20/88	26.0	256.0	7.93	-1.0	12.5	56	0.050	0.100	0.009	-1.000	3.30
R7	08/16/88	29.2	262.0	8.22	7.7	5.3	2	-1.000	-1.000	-1.000	-1.000	3.20
R7	09/10/88	25.5	235.0	8.04	8.9	0.7	16	-1.000	-1.000	-1.000	-1.000	3.00
R7	10/22/88	16.9	268.0	7.80	15.4	0.5	0	-1.000	-1.000	-1.000	-1.000	3.00
R7	11/18/88	8.8	215.0	7.35	11.2	0.4	4	0.000	0.510	0.008	0.050	3.20
R7	12/23/88	7.2	198.0	-1.00	13.1	6.3	2	-1.000	-1.000	-1.000	-1.000	4.00
## RUSH												
R8	02/03/88	7.5	119.0	8.10	12.2	-1.0	6	0.170	0.030	0.003	-1.000	5.00
R8	03/28/88	15.0	125.0	8.33	13.0	-1.0	0	0.080	0.100	0.005	-1.000	3.00
R8	05/03/88	20.3	179.0	8.31	-1.0	-1.0	8	0.080	0.100	0.005	-1.000	4.50
R8	06/22/88	29.2	280.0	7.87	-1.0	13.0	12	-1.000	-1.000	-1.000	-1.000	3.00
R8	07/20/88	27.0	237.0	7.92	-1.0	7.2	180	0.060	0.200	0.007	-1.000	3.30
R8	08/16/88	31.1	275.0	7.74	8.6	5.4	4	-1.000	-1.000	-1.000	-1.000	3.20
R8	09/10/88	25.4	210.0	8.03	9.0	0.8	0	-1.000	-1.000	-1.000	-1.000	3.00
R8	10/22/88	17.1	270.0	7.88	14.0	0.6	0	-1.000	-1.000	-1.000	-1.000	3.00

Buffalo National River
1988 Water Quality Data

RIVER LOCATIONS

SITE #	DATE	WATER TEMP. (deg.C)	SPECIFIC CONDUCTIVITY (umhos)	pH	DISSOLVED OXYGEN (mg/l)	TURBIDITY (FTU)	FECAL COLIFORM (col./100ml)	NO3/NO2-N (mg/l)	TKN (mg/l)	TP (mg/l)	NH4-N (mg/l)	STAFF GAUGE (FT)
R8	11/18/88	9.6	224.0	7.25	11.0	0.4	0	0.005	0.390	0.016	0.000	3.20
R8	12/23/88	7.1	195.0	-1.00	13.2	0.8	4	-1.000	-1.000	-1.000	-1.000	4.00
** MOUTH												
R9	02/03/88	7.5	132.0	8.05	10.8	-1.0	0	0.170	0.030	0.000	-1.000	5.00
R9	03/28/88	14.0	178.0	8.36	12.8	-1.0	0	0.030	0.100	0.000	-1.000	3.00
R9	05/03/88	19.2	180.0	8.32	-1.0	-1.0	18	0.030	0.100	0.000	-1.000	4.50
R9	06/22/88	29.6	299.0	7.92	-1.0	11.0	4	-1.000	-1.000	-1.000	-1.000	3.00
R9	07/20/88	28.5	260.0	8.03	-1.0	1.0	4	0.040	0.200	0.005	-1.000	3.30
R9	08/16/88	29.6	263.0	8.00	8.5	4.6	14	-1.000	-1.000	-1.000	-1.000	3.20
R9	09/10/88	18.4	215.0	7.45	8.0	0.7	4	-1.000	-1.000	-1.000	-1.000	3.00
R9	10/22/88	15.4	275.0	7.72	12.5	0.8	6	-1.000	-1.000	-1.000	-1.000	3.00
R9	11/18/88	9.6	-1.0	7.06	10.9	0.6	0	0.008	0.560	0.008	0.030	3.20
R9	12/22/88	9.0	214.0	-1.00	14.2	0.8	4	-1.000	-1.000	-1.000	-1.000	4.00

APPENDIX II
TRIBUTARIES & SPRINGS
ORIGINAL DATA; 1988

Negative values indicates the parameter was not analyzed.
Missing staff gage readings indicated by -99.99.
Sampling site listed in alphabetical order.

Buffalo National River
1988 Water Quality Data

TRIBUTARIES & SPRINGS

SITE #	DATE	WATER TEMP. (deg. C)	SPECIFIC CONDUCTIVITY (umhos)	pH	DISSOLVED OXYGEN (mg/l)	TURBIDITY (FTU)	FECAL COLIFORM (colonies/100ml)	STAFF GAUGE (FT)
** BEAR CREEK								
T12	06/14/88	29.0	-1.0	7.82	-1.0	0.9	20	-99.99
T12	07/05/88	24.8	304.0	7.53	-1.0	1.1	16	-99.99
T12	07/29/88	26.1	268.0	7.47	7.1	0.5	16	-99.99
T12	08/08/88	27.8	255.0	8.10	8.1	0.5	14	-99.99
T12	09/04/88	21.0	208.0	7.45	8.1	0.5	20	-99.99
** BEECH CREEK								
T1	05/23/88	20.0	111.0	7.93	9.1	7.4	350	-99.99
T1	07/25/88	29.6	218.0	8.32	-1.0	1.5	16	0.00
** BIG CREEK/L								
T18	06/16/88	28.0	-1.0	8.03	-1.0	0.5	8	-99.99
T18	07/06/88	28.8	292.0	8.01	-1.0	0.9	6	-99.99
T18	07/27/88	28.8	267.0	8.18	10.0	0.6	32	-99.99
T18	08/10/88	31.2	240.0	8.17	9.9	0.3	0	-99.99
** BIG CREEK/U								
T6	06/02/88	22.9	210.0	7.88	-1.0	0.9	8	-99.99
T6	06/29/88	25.6	278.0	7.65	-1.0	12.7	8	-99.99
T6	07/26/88	25.5	285.0	7.73	-1.0	3.2	2	-99.99
T6	08/18/88	26.0	261.0	7.40	6.3	0.9	26	-99.99
T6	09/03/88	25.8	273.0	7.96	9.6	0.6	4	-99.99
** CALF CREEK								
T10	06/14/88	21.0	-1.0	7.79	-1.0	1.0	12	-99.99
T10	06/29/88	23.2	310.0	7.70	-1.0	17.5	8	-99.99
T10	07/23/88	24.5	290.0	7.69	-1.0	2.4	8	-99.99
T10	08/18/88	24.1	325.0	7.84	9.3	2.6	20	-99.99
T10	09/03/88	20.4	275.0	7.23	8.0	2.0	692	-99.99
** CAVE CREEK								
T8	06/02/88	23.5	212.0	-1.00	-1.0	0.9	74	-99.99
T8	06/29/88	26.7	265.0	7.91	-1.0	14.0	6	-99.99
T8	07/26/88	26.5	255.0	7.94	-1.0	0.9	0	-99.99
T8	08/18/88	27.0	257.0	8.41	9.2	0.5	18	-99.99
T8	09/03/88	24.4	222.0	8.04	9.8	0.5	16	-99.99
** CECIL CREEK								
T3	06/28/88	28.5	333.0	7.61	-1.0	13.5	0	1.05
T3	07/25/88	26.7	287.0	7.70	-1.0	1.7	10	1.18
T3	08/09/88	28.2	290.0	7.81	7.4	1.4	36	0.15
T3	08/30/88	20.0	270.0	6.91	8.1	1.7	4	-99.99

Buffalo National River
1988 Water Quality Data

TRIBUTARIES & SPRINGS

SITE #	DATE	WATER TEMP. (deg. C)	SPECIFIC CONDUCTIVITY (umhos)	pH	DISSOLVED OXYGEN (mg/l)	TURBIDITY (FTU)	FECAL COLIFORM (colonies/100ml)	STAFF GAUGE (FT)
** CEDAR CREEK								
T19	06/16/88	23.5	-1.0	8.10	-1.0	0.9	14	-99.99
T19	07/06/88	22.3	396.0	7.88	-1.0	0.9	40	-99.99
T19	07/27/88	22.7	370.0	7.96	8.3	5.0	2	-99.99
T19	08/10/88	24.0	350.0	7.80	7.6	0.4	18	-99.99
** CLABBER CREEK								
T17	06/16/88	22.9	-1.0	8.05	-1.0	1.0	34	-0.34
T17	07/06/88	24.2	403.0	7.84	-1.0	0.7	180	-0.34
T17	07/27/88	24.2	385.0	7.86	8.8	0.5	30	-0.34
T17	08/10/88	26.7	380.0	7.75	8.1	0.4	10	-0.40
T17	09/10/88	25.5	384.0	7.84	10.3	0.4	12	-0.36
** DAVIS CREEK								
T7	06/02/88	18.3	309.0	8.08	-1.0	0.3	14	0.30
T7	06/29/88	20.9	392.0	7.73	-1.0	0.6	30	-99.99
T7	07/26/88	21.6	377.0	7.85	-1.0	0.3	18	2.20
T7	08/18/88	22.3	420.0	7.69	7.9	0.3	12	2.02
T7	09/03/88	21.6	375.0	7.55	9.8	0.3	22	2.08
** GILBERT SPRING								
S41	05/11/88	16.2	293.0	7.86	-1.0	0.7	2	-99.99
S41	06/29/88	17.0	344.0	7.52	-1.0	0.4	26	-99.99
S41	07/26/88	18.0	300.0	7.53	-1.0	0.4	66	-99.99
S41	09/04/88	16.9	318.0	7.08	9.4	0.6	92	-99.99
** LEATHERWOOD CREEK								
T24	06/16/88	23.1	-1.0	8.18	-1.0	0.4	164	-99.99
T24	07/06/88	24.9	360.0	7.94	-1.0	0.3	54	-99.99
T24	07/27/88	24.7	365.0	7.93	7.6	0.4	28	-99.99
T24	08/10/88	27.0	350.0	7.68	7.6	0.3	10	-99.99
** LITTLE BUFFALO RIVER								
T5	06/02/88	22.8	182.0	7.92	-1.0	0.8	56	-0.30
T5	06/29/88	26.3	265.0	7.78	-1.0	1.0	16	-99.99
T5	07/26/88	26.2	245.0	7.92	-1.0	0.9	10	-99.99
T5	08/18/88	26.4	242.0	7.46	7.0	0.5	16	-99.99
T5	09/03/88	26.0	223.0	8.17	11.3	0.4	30	-99.99
** LUALLEN SPRING								
S2	05/11/88	15.5	182.0	8.08	-1.0	1.2	4	-99.99
S2	05/23/88	13.4	129.0	7.79	-1.0	22.0	705	-99.99
S2	06/28/88	13.0	212.0	7.65	-1.0	0.5	0	-99.99
S2	07/25/88	13.7	183.0	7.33	-1.0	-1.0	6	-99.99
S2	07/12/88	13.8	186.0	7.32	-1.0	22.0	780	-99.99

Buffalo National River
1988 Water Quality Data

TRIBUTARIES & SPRINGS

SITE #	DATE	WATER TEMP. (deg. C)	SPECIFIC CONDUCTIVITY (umhos)	pH	DISSOLVED OXYGEN (mg/l)	TURBIDITY (FTU)	FECAL COLIFORM (colonies/100ml)	STAFF GAUGE (FT)
** MIDDLE CREEK								
T23	06/16/88	24.1	-1.0	8.15	-1.0	0.4	4	-99.99
T23	07/06/88	24.8	415.0	7.93	-1.0	0.3	12	-99.99
T23	07/27/88	25.0	384.0	7.94	8.5	0.2	2	-99.99
T23	08/10/88	25.5	380.0	7.53	7.7	0.3	26	-99.99
** MILL CREEK/M								
T11	06/14/88	22.2	-1.0	7.83	-1.0	0.4	58	-99.99
T11	06/29/88	18.8	308.0	7.81	-1.0	0.5	12	-99.99
T11	07/23/88	20.6	95.0	7.94	-1.0	0.2	6	-99.99
T11	08/18/88	18.9	317.0	7.71	10.6	0.2	8	-99.99
T11	09/03/88	17.8	301.0	7.47	10.6	0.3	4	-99.99
** MILL CREEK/U								
T4	05/23/88	20.5	255.0	7.88	8.4	2.2	247	-99.99
T4	06/28/88	26.7	307.0	7.73	-1.0	10.7	2	-99.99
T4	07/26/88	24.2	305.0	7.88	-1.0	0.5	20	-99.99
T4	08/09/88	27.8	283.0	7.63	8.8	0.3	18	-99.99
T4	09/03/88	24.3	282.0	7.82	8.7	0.3	4	-99.99
** MITCH HILL SPRING								
S33	05/11/88	15.0	285.0	7.64	-1.0	0.9	0	-99.99
S33	06/29/88	14.6	335.0	7.35	-1.0	0.6	0	-99.99
S33	07/26/88	14.9	318.0	7.38	-1.0	0.4	2	-99.99
S33	08/18/88	13.6	338.0	6.30	9.1	0.3	11	-99.99
S33	09/03/88	14.2	280.0	6.94	9.4	0.3	2	-99.99
S33	06/02/88	15.3	294.0	7.55	-1.0	0.8	0	-99.99
** PONCA CREEK								
T2	02/03/88	6.2	139.0	8.04	-1.0	0.0	16	2.00
T2	05/23/88	18.5	188.0	7.92	8.9	8.2	550	-99.99
T2	06/28/88	23.2	304.0	7.63	-1.0	12.0	4	-99.99
T2	07/25/88	24.5	245.0	7.90	-1.0	1.7	8	0.23
T2	08/09/88	25.2	325.0	7.42	5.9	1.6	10	0.16
T2	08/30/88	19.6	270.0	7.52	8.1	1.0	0	0.16
** RICHLAND CREEK								
T9	06/02/88	19.7	103.0	7.60	-1.0	1.1	54	-0.08
T9	06/29/88	25.0	220.0	7.77	-1.0	19.6	109	-0.98
T9	07/26/88	23.9	207.0	7.76	-1.0	1.0	40	-2.40
T9	08/18/88	27.9	250.0	8.81	13.8	11.9	610	-3.27
T9	09/03/88	24.8	190.0	8.08	11.6	4.6	594	-3.60

Buffalo National River
1988 Water Quality Data

TRIBUTARIES & SPRINGS

SITE #	DATE	WATER TEMP. (deg. C)	SPECIFIC CONDUCTIVITY (umhos)	pH	DISSOLVED OXYGEN (mg/l)	TURBIDITY (FTU) (colonies/100ml)	FECAL COLIFORM	STAFF GAUGE (FT)
** RUSH CREEK								
T16	06/16/88	17.2	-1.0	7.65	-1.0	1.0	8	-99.99
T16	07/06/88	17.8	325.0	7.67	-1.0	0.4	22	-99.99
T16	07/27/88	18.2	305.0	7.62	8.7	0.4	8	-99.99
T16	08/10/88	19.3	285.0	6.88	7.6	1.8	4	-99.99
T16	09/10/88	19.3	283.0	7.63	9.3	0.5	22	-99.99
** TOMAHAWK CREEK								
T14	06/14/88	27.0	-1.0	8.12	-1.0	0.6	34	-99.99
T14	07/05/88	23.6	363.0	7.83	-1.0	0.5	60	-99.99
T14	07/29/88	23.9	325.0	7.92	8.4	0.5	64	-99.99
T14	08/08/88	26.7	325.0	8.07	8.4	0.5	87	-99.99
T14	09/04/88	19.4	276.0	7.73	9.6	6.9	776	-99.99
** WATER CREEK								
T15	06/14/88	28.0	-1.0	8.26	-1.0	0.5	4	-99.99
T15	07/05/88	26.5	295.0	8.04	-1.0	0.6	32	-99.99
T15	07/29/88	26.5	283.0	8.16	9.1	0.4	6	-99.99
T15	08/08/88	25.6	278.0	8.12	8.1	0.3	4	-99.99
T15	09/04/88	21.0	235.0	8.10	10.4	10.2	680	-99.99

BUFFALO NATIONAL RIVER
WATERSHED INVENTORY

Page No. 1
07/25/89

Name of Stream	Drainage Area (acres)	Location: Side River of Mile River?	Topo. Quad. Tributaries' Mouth	Monitored by NPS?	Site #	% NPS NPDES Permit ?
COOK HOLLOW	1282	0.5 N	BUFFALO CITY	N		97 N
STEWART CREEK	1473	2.4 S	BUFFALO CITY	N		28 N
GOSHA CREEK	323	4.2 S	BUFFALO CITY	N		49 N
COW CREEK	2080	4.6 N	BUFFALO CITY	N		99 N
BRUSH CREEK 2	1616	5.2 S	BUFFALO CITY	N		35 N
LEATHERWOOD CREEK	7834	7.4 S	BIG FLAT	Y	T24	3 N
SHORT CREEK	1300	8.9 S	BIG FLAT	N		5 N
MIDDLE CREEK	6285	9.4 S	BIG FLAT	Y	T23	4 N
CANEY HOLLOW	499	10.1 S	BIG FLAT	N		46 N
BEAR HOLLOW	578	11.0 N	BIG FLAT	N		99 N
BIG CREEK	79745	13.0 S	BIG FLAT	Y	T19	2 N
BRUSH CREEK 1	1611	15.7 N	BIG FLAT	N		99 N
FISHTRAP HOLLOW	805	18.4 S	COZAHOME	N		20 N
LONELY HOLLOW	279	19.5 S	COZAHOME	N		80 N
BOAT CREEK	2390	22.7 N	REA VALLEY	Y	T21	98 N
CABIN CREEK	939	23.6 N	REA VALLEY	Y	T20	42 N
SILVER HOLLOW	313	24.2 S	COZAHOME	N		99 N
CLABBER CREEK	15643	24.5 N	REA VALLEY	Y	T17	2 N
CEDAR CREEK	2860	24.8 N	REA VALLEY	Y	T19	12 N
RUSH CREEK	9508	24.8 N	COZAHOME	Y	T16	9 N
INGRAM CREEK	1502	29.9 S	COZAHOME	N		28 N
PANTHER CREEK	3971	30.5 N	COZAHOME	N		28 N
HICKORY CREEK	2527	32.0 S	COZAHOME	N		5 N
ROCK CREEK	2766	32.3 S	COZAHOME	N		4 N
HOGSKIN HOLLOW	250	33.1 N	COZAHOME	N		99 N
JIM HOLLOW	495	33.4 N	COZAHOME	N		91 N
PETER HOLLOW	282	33.8 N	COZAHOME	N		62 N
WATER CREEK	22699	35.4 N	COZAHOME	Y	T15	2 N
KIMBALL CREEK	768	35.6 S	COZAHOME	N		13 N
SPRING CREEK	7601	39.2 S	COZAHOME	N		1 N
GREEN HAW HOLLOW	1457	43.0 N	MAUMEE	N		14 N
LITTLE ROCKY CREEK	2004	45.9 S	MAUMEE	N		10 N
ROCKY CREEK	3369	46.3 S	MAUMEE	N		2 N
TOMAHAWK CREEK	21324	49.1 N	MAUMEE	Y	T14	1 N
BRUSH CREEK	11520	53.0 S	MARSHALL	Y	T13	1 N
BEAR CREEK	53415	53.6 S	MARSHALL	Y	T12	1 N
DRY CREEK	6323	55.7 N	MARSHALL	N		8 N
MILL CREEK	9177	61.0 N	SNOWBALL	Y	T11	1 N
CALF CREEK	28616	62.0 S	SNOWBALL	Y	T10	3 N
ROCKY HOLLOW	2416	65.7 N	SNOWBALL	N		14 N
HAGE HOLLOW	3251	69.3 S	SNOWBALL	N		16 N
BEN BRANCH	712	72.2 S	SNOWBALL	N		45 N
JAMISON CREEK	4716	73.9 N	SNOWBALL	N		3 N
RICHLAND CREEK	75952	75.7 S	EULA	Y	T9	5 N
ROUSHEDGE HOLLOW	1856	77.0 N	EULA	N		10 N
CANE BRANCH	4556	80.5 N	EULA	N		3 N
SWEETGUM HOLLOW	295	80.5 N	EULA	N		17 N

BUFFALO NATIONAL RIVER
WATERSHED INVENTORY

Name of Stream	Drainage Area (acres)	Location: Side River of Mile River?	Topo. Quad. Tributaries' Mouth	Monitored by NPS?	Site #	% NPS NPDES Permit ?
CAVE CREEK	30402	81.5 S	EULA	Y	T8	1 N
DAVIS CREEK	16760	83.7 N	WESTERN GROVE	Y	T7	1 N
MILL BRANCH	2304	83.7 N	WESTERN GROVE	N		2 N
BIG CREEK	53460	87.5 S	MT JUDEA	Y	T6	1 N
LICK CREEK	2818	88.0 S	EULA	N		6 N
HANCOCK HOLLOW	913	89.2 N	MT JUDEA	N		20 N
STILLHOUSE HOLLOW	540	92.3 N	MT JUDEA	N		13 N
ROCK CREEK	3667	94.3 S	MT JUDEA	N		0 N
SHELDON BRANCH	1842	94.3 S	MT JUDEA	N		3 N
BEAR CAVE HOLLOW 2	1029	97.0 S	HASTY	N		24 N
WELLS CREEK	6942	97.1 N	HASTY	N		1 N
LITTLE BUFFALO RIV R	81973	97.8 S	HASTY	Y	T5	1 Y
BOOMER HOLLOW	992	98.3 N	HASTY	N		4 N
MILL CREEK	12423	101.8 N	JASPER	Y	T4	3 Y
HOSKIN HOLLOW	1223	103.7 N	JASPER	N		10 N
SAWMILL HOLLOW	1272	105.9 S	JASPER	N		10 N
CECIL CREEK	12704	109.6 N	JASPER	Y	T3	25 N
WEBB BRANCH	1998	109.8 S	JASPER	N		19 N
DRY CREEK	1018	118.1 S	PONCA	N		39 N
SHOP CREEK	805	118.2 S	PONCA	N		38 N
CLEMMON HOLLOW	380	119.2 N	PONCA	N		90 N
BEAR CREEK	764	120.5 S	PONCA	N		60 N
CECIL HOLLOW	343	120.5 N	PONCA	N		95 N
INDIAN CREEK	1525	120.6 S	PONCA	N		81 N
BEAR CAVE HOLLOW 1	265	122.6 N	PONCA	N		99 N
FISHTRAP HOLLOW	332	123.2 N	PONCA	N		95 N
HENMED IN HOLLOW	667	123.5 N	PONCA	N		95 N
SNEEDS CREEK	2740	123.9 N	PONCA	N		98 N
JACKIES BIG HOLLOW	235	125.3 S	PONCA	N		99 N
BEECH CREEK	1007	125.6 S	PONCA	N		11 N
CLIFF HOLLOW	817	127.3 N	PONCA	N		98 N
RUNNINS CREEK	2632	127.4 S	PONCA	N		10 N
STEEL CREEK	2002	128.2 S	PONCA	N		23 N
LEATHERWOOD CREEK	1048	130.9 S	PONCA	N		29 N
PONCA CREEK	2711	130.9 N	PONCA	Y	T2	6 N
BIG HOLLOW	406	131.6 S	PONCA	N		76 N
CLARK CREEK	1252	132.0 N	PONCA	N		89 N
DRY CREEK	834	132.3 S	PONCA	N		16 N
WHITELY CREEK	3420	133.2 N	BOXLEY	N		15 N
MOORE CREEK	3551	134.8 N	BOXLEY	N		12 N
ARRINGTON CREEK	1506	135.1 S	BOXLEY	N		48 N
BEECH CREEK	12041	135.8 N	BOXLEY	Y	T1	4 N
SMITH CREEK	4499	137.2 S	BOXLEY	N		10 N
UPPER BUFFALO	33556	141.3 S	BOXLEY	N		1 N

BUFF Water Quality Report, 1988

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